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Low-cost cottage construction in America.

by

Winthrop A. Hamlin

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DEPARTMENT OF SOCIAL ETHICS
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NUMBER 7

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A STUDY BASED ON THE HOUSING COLLECTION
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LOW-COST COTTAGE CONSTRUCTION IN AMERICA

THE housing problem of America has been affected by the War much as other social problems have, — the new evils that have been created are small and superficial as compared with the old evils that have been accentuated, brought out vividly and clamorously. In Bridgeport, Connecticut, in Flint, Michigan, and in many places between and beyond, there has been the same harsh line of causation, — war orders, industrial boom, sudden influx of workers, house famine, a rise in rentals, and more or less inadequate attempts by employers and by commercial and philanthropic agencies to meet the demand for homes. However dubious the success of those attempts may be, there is at least an awakened sense of responsibility in solving a problem now acute and vivid but by no means new, the problem of providing adequate low-cost housing.

In our present stage of economic development, the housing of workers is closely bound to the industry itself. There are four main reasons (by no means mutually exclusive) for the housing of employees by the employer: (1) *insufficient housing,* when a manufacturer moves into a small town or when for other reasons there is a scarcity of houses, he must provide dwellings in order to get and keep his labor; (2) *poor housing,* the existing houses while sufficient in capacity may be so unsanitary that the employer must build houses for his workers in order to insure their health and the consequent productiveness of his factory; (3) *exploitation,* the employer may desire to increase his economic hold on them by making their dwelling comfort dependent on their continued allegiance to him; and (4) *paternalism,* he may in a spirit of genuine benevolence believe that the living conditions of his employees can best be improved by his direct intervention. When the employers fail to provide house accommodation for their workers, philanthropic agencies sometimes initiate the local movement for more and better housing.

It is difficult to get either exact or up-to-date figures for the incomes of the wage-earners throughout this country. The data given below, while not confined entirely to heads of families nor to adult workers, will help to indicate the general level of income to which the price of adequate housing must accommodate itself. For the laborers (22 per cent of the wage-earning force) in the iron and steel industry the average full-time weekly wage in 1913 was $13.05.[1] For all male wage-earners in the cotton manufacturing industry the average full-time weekly wage in 1914 was $10.44; in the woolen and worsted industry $11.46.[2] In 1914, the average full-time weekly wage of 56 per cent of all the male wage-earners in the boot and shoe industry was $12.29.[3] Urban families having incomes between $500 and $800 per annum generally spend between a fifth and a fourth of it for rent. A wage-earner who is making proper allowance for food and clothing will not spend more for his rent per month than he is earning per week. Allowing 9 per cent gross income on investment, the $12 a week man with a family is limited to a house costing, with land and improvements, not more than $1600; the $15 a week man to a dwelling costing not more than $2000. These weekly wage figures do not take into account on the one hand the fact that the man may not be the only wage-earner in the family, and on the other the fact that individual unemployment or idleness of the industrial plant is practically certain to lessen the average weekly earnings for the year. Altogether, it is evident that a large part of our industrial population cannot afford to pay more than about $1800 for a home; yet any survey of the present supply of houses or of the present construction costs indicates clearly that exceedingly few houses at such price are available. The problem of raising wages and maintaining or improving the standards of living in general is beyond the bounds of this study, which is concerned primarily with the forms and methods of low-cost cottage construction.

Adequate housing involves (1) *shelter*, protection from wind, rain, snow, ground moisture, and excessive cold and heat; (2) *sanitation*, arrangements for sunlight, fresh air, and pure water, heating, and the cleansing of the house of its various wastes; (3) *provision for the family life*, separate sleeping-rooms for parents and for the children of different sexes, and the common rooms, such as the living-room, dining-room, and kitchen, arranged and equipped with a view to comfort and efficiency; and (4) *aesthetic pleasure,* " be it ever so humble," from the house itself and its surroundings. These requirements of adequacy are simply the minimum in housing without which one should not be satisfied. Healthfulness has been commonly though not yet sufficiently recognized as a requirement; happiness, or the chance for happiness, is still wrongly thought of as a luxury without which one may yet lead a profitable life.

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[1] Figures computed from Bulletin 168, *U. S. Bureau of Labor Statistics.*

[2] Figures computed from Bulletin 190, *U. S. Bureau of Labor Statistics.*

[3] Figures computed from Bulletin 178, *U. S. Bureau of Labor Statistics.*

In studying the ways in which these standards have been and can be realized in low-cost housing, this account can hardly keep exactly within a particular limit of expense. The variations in wages, in the costs of building materials, and in the methods of undertaking building enterprises, over periods of time and in different parts of the country,[1] are so great that precise elimination of houses costing over $2000 is impracticable. Also, the necessary information is not always available, since the company or individual supplying the data may not care to give figures, or may give the rent (which different companies figure on different bases) but not the selling price, or may give the construction cost without the land cost, or may not include complete " modern improvements " in the house cost. Consequently this account will consider housing that in the construction cost, with all the internal improvements involved, approximates $2000 or falls below that figure.

Of the four general types of dwelling-house, — the detached (or single), the semi-detached (or double), the row, and the multiple (or tenement), only the first and second will be considered. Of the detached house types, only the one-family house, not the " two-flat house " nor the " three-decker," will be treated. While the tenement, the row dwelling, the " two-flat house," and the " three-decker " are advantageous because of their economy of land and of exterior wall construction, they are unsatisfactory by reason of their fire risk and their lack of privacy and of immediate access to land. The semi-detached house has a small advantage over the detached in the economies of the party wall and of land, and is most attractive to the prospective owner who desires an income from part of his house; because of its longer horizontal lines the semi-detached house can be made architecturally pleasing more easily than can the detached. The detached house, or cottage, has the advantages of maximum light and ventilation (the largest number of corner rooms and cross drafts), of minimum fire-risk, of independent use of land, and of maximum opportunity for a convenient arrangement of the rooms.

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[1] On July 1, 1917, carpenters' wages per hour varied from 40–45 cents in New Orleans to 70 cents in Chicago, St. Louis, Denver, and Seattle; plasterers' wages from 55 cents in Atlanta to 87½ cents in Denver, Seattle, and San Francisco. There were similar variations in the other building trades. (Figures from *Building Age,* October, 1917.)

In building Indian Hill, the industrial village of the Norton Company, Worcester, Mass., it was found that a type of house which in 1915 cost $3,188 to build had in 1916 risen in cost to $3,791. But a house closely comparable to this type quoted at $3,791 in Massachusetts in 1916, was contracted for in 1917 for only $2,525 in Erwin, Tennessee. So that the 1916 Massachusetts house cost 19 per cent more to build than the same style of house in that same state in the previous year, and 50 per cent more than a similar house in a different locality in the following year. (Data from " Indian Hill," by C. C. May, *National Housing Association Publications,* July, 1917.)

FRAME CONSTRUCTION

The original dwellings of the laborers in the coal and iron mines of the South and West were often tumble-down shacks of rough boarding or huts of clay, which conduced neither to the physical nor to the moral health of the occupants. To remedy these conditions many of the companies have built square, one-story, hip-roofed frame cottages, with four or sometimes three or five rooms, usually with water connection but no toilet, with separate privies outside, and occasionally with fire grates for heating. Usually these cottages cost less than $1000 to build and rent for $2 per room per month. While marking a great sanitary advance over the shacks that they have displaced, such cottages as now built lack adequate plumbing; and their exteriors are individually without character and collectively monotonous. Where the exterior walls are shingled, as in the case of the cottages of one Eastern company,[1] the result is more pleasing.

Most of the Eastern companies, facing somewhat higher standards of living than are prevalent in the Western mining centers, have tended more toward the five- to seven-room two-story (or story-and-a-half) house, with pitch or gambrel roof, and equipped with ordinary sanitary conveniences. Commercial builders have followed this same plan. Just prior to the War these houses ranged in price from $1400 to $2400.

[1] No. 6; Chart A.

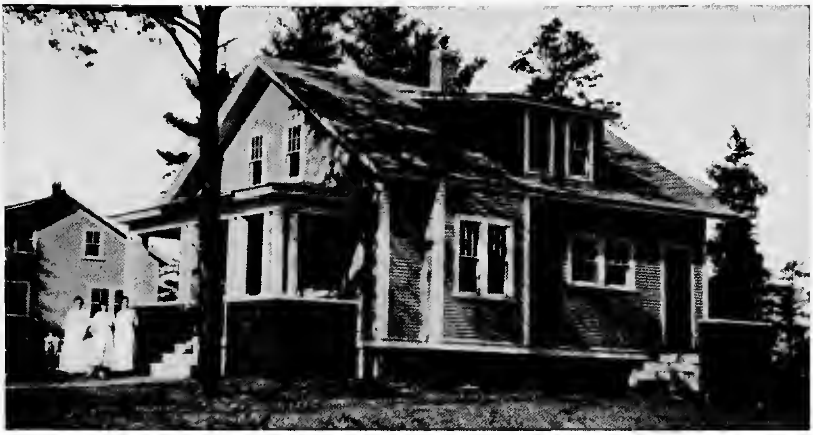

Fig. 1. Six-room cottage, Billerica Garden Suburb, 1916. Construction cost, $1,800.

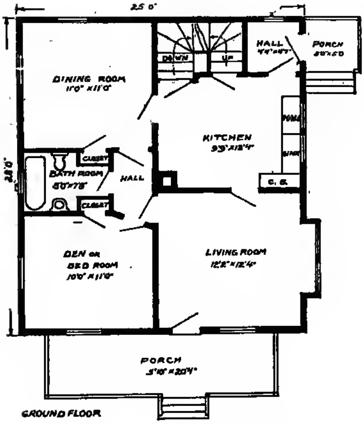

Fig. 1a. Floor plans of the Billerica cottage.

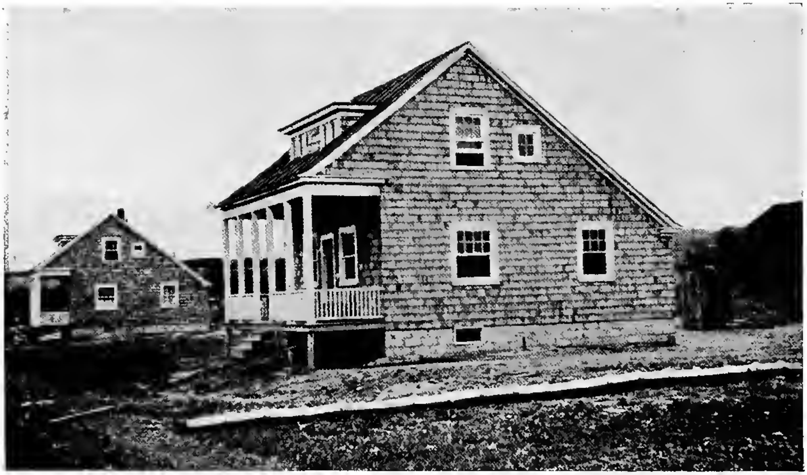

Fig. 2. Six-room cottages, Mt. Union Co., Kistler, Pa., 1915. Construction cost, approx. $1,600.

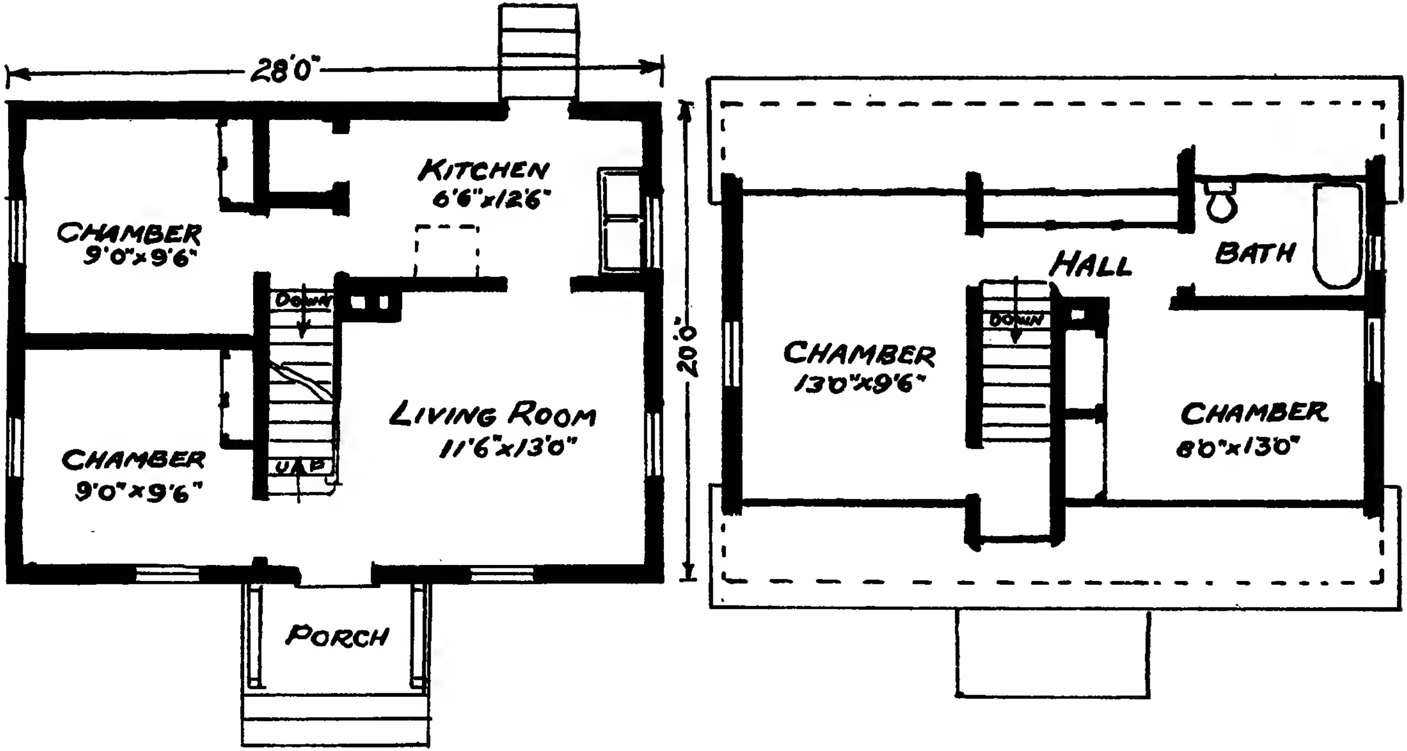

Fig. 2*a*. Floor plans of the Kistler cottages.

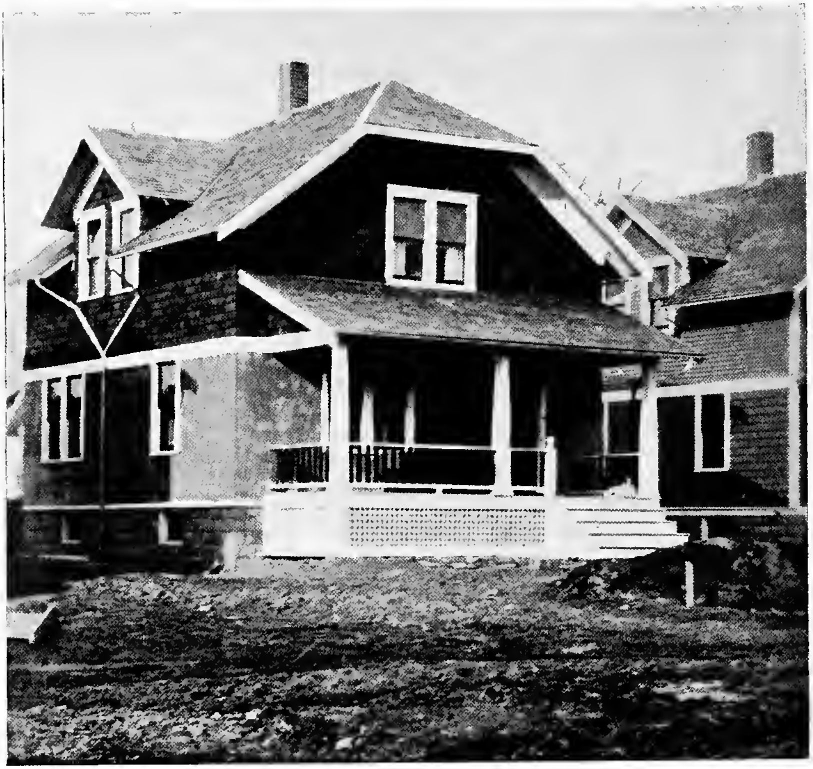

FIG. 3. Six-room house, Kenosha Homes Co., Kenosha, Wis., 1916. (Type D.) Construction cost, $1,725.

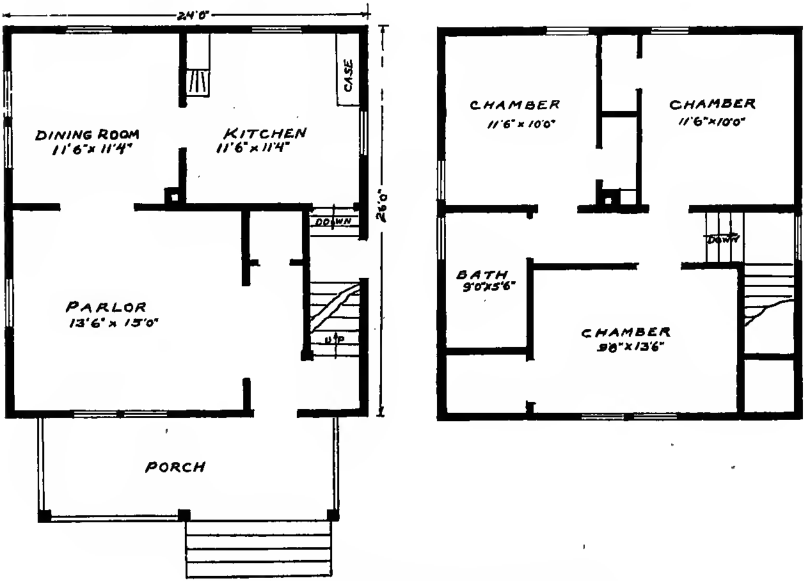

FIG. 3a. Floor plans of Type D, Kenosha, Wis.

Both the one-story, hip-roofed cottage and the two-story pitch-roofed house ordinarily met the mere physical needs of their occupants. Recently, however, particularly in the Eastern and North Central States, attempts have been made and are now being made to supply low-priced housing that even despite the present high building costs shall provide the workingman with a distinctly attractive, sanitary, comfortable dwelling. These houses, ranging in type from modified bungalows to two-story structures, will be described more in detail; the chief facts are summarized in Chart A.

In the Billerica Garden Suburb at North Billerica, Mass., one house finished late in 1916 illustrates the more recent achievements in cottage housing. As illustrated in Figure 1, this is a " semi-bungalow," 25×28 feet (with piazza 20×7 feet), containing six rooms and a bath.[1] " The building is of frame construction, triple studding at the corners and double studding at all openings; sides are covered with matched boards, a layer of good building paper, and cypress clapboards; roof closely boarded and covered with asphalt shingles with slate chip surface laid 4½ inches to the weather. The inside is finished in North Carolina pine with hard pine flooring of good grade, cypress five-panel doors, front door of the craftsman type of quartered oak; outside painted with three coats of lead and oil and inside finished with two coats of shellac and one of spar varnish; kitchen and bathroom have three coats of good wall paint." The bathroom has bowl, tub, and toilet of modern type, and the kitchen set tubs, sink, and necessary cabinet work. Generous provision is made for storage room, utilizing for this purpose — as is often done in story-and-a-half houses — the space under the sloping roof near the eaves; there is also a place for a refrigerator and for hanging outdoor clothing in the back entry. " The house is lighted throughout with electricity, triple ' showers ' in living-room and dining-room and two fixtures in the kitchen." The cellar contains an adequate furnace and has concrete walls with four window openings. The construction cost was a little over $1800.

In Kistler, Pa., near Altoona, six-room houses were built at an approximate cost of $1600 in 1915 and 1916.[2] These Kistler cottages (Fig. 2) are a story and a half in height, with cellar walls of field stone, frame shingled walls above, durable rubberoid roof, double-hung windows, bath, toilet, kitchen sink, set tubs, water and sewer connection. Wiring was included, also a small furnace. The lots are 40×100 feet, valued at $200 each. Some of these houses are rented for $10 a month, but most of them have been sold.

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[1] Description taken from pp. 15 and 16 of the *Fourth Annual Report of the Homestead Commission, Commonwealth of Massachusetts.*

[2] No. 22; Chart A.

In Kenosha, Wis., are some quite attractive houses built in 1916 by the Kenosha Homes Company in an attempt to house some of the three or four thousand workers that have recently come to that city. This Company brought construction costs near to the minimum by building in quantity, so purchasing its materials on the most favorable terms, and by starting a new house almost every day, so keeping a small force of labor steadily employed at a low cost per hour. The labor employed was specialized, some carpenters raising the frames, others shingling the roofs, others hanging doors; when the share of each particular group in each house was done it moved on to the next, bringing to each an expertness that resulted in better and quicker work. These houses are mostly single-family detached houses, costing between $1700 and $1800 without the land, which averages $375 per lot. Of four representative types, the first, D (Fig. 3), is a story-and-a-half, six-room house, costing $1725 to build, and having a cellar with cement block walls, wood frame with stucco covering for first floor, shingles for walls above and for roof surfaces. The rooms are finished in plaster with wood floors, and double-hung windows. The plumbing includes bathtub, toilet, and kitchen sink. Types E and F (Figs. 4 and 5) are alike in having five rooms and a bath and in costing $1700 to construct; they differ simply in the arrangement of the rooms and in their exterior finish. Type G (Fig. 6), costing $1800, is a seven-room, story-and-a-half house, with ample front porch and small back porch.

(The descriptions of the Billerica, Kistler, and Kenosha houses have been taken largely from the *Fourth Annual Report of the Homestead Commission, Commonwealth of Massachusetts,* to whose courtesy is due also the reproduction of the photographs and plans of these houses and of the brick dwellings in Salem.)

An attempt to supply much needed housing, similar to that of the Kenosha Homes Company, is being made in Beloit, Wis., by the recently organized Beloit Model Homes Company, which has " devised a set of plans, permitting the standardization of the construction of these houses; yet no two of the houses look alike." On a tract of twenty acres, the Company's first unit of twenty-five houses has recently been completed; this unit consists of eighteen one-story, four story-and-a half, and three two-story houses. The estimated net cost of the one-story and story-and-a-half houses is about $1550, on lots not less than 44 feet in width and costing with all improvements approximately $485, so that the total cost of each house with land will be $2035; the selling price, to cover the general expenses of the enterprise, will be about $2500 per house. The houses are of frame construction, most of them with 4, 6, and 8 inch siding, but a few have shingled walls, and a few others are of stucco. The cellar extends underneath the whole house, has a cement floor, and contains two washtubs and a hot-air furnace. The kitchen is provided with a large sink, a gas stove having an oven, an ample closet, and cabinet space for dishes. There is also a hot-water boiler, with a gas-heater attached, to heat the water all the year round. The bathroom is fully equipped, even including a medicine closet and mirror. There is of course water and sewerage connection. The house is both piped for gas and wired for electricity. There are two bedrooms, each 11×12 feet, a kitchen 11×12 feet, and in most of the houses a dining-room 10×10 feet; in one type there is a combined living- and dining-room 13×20 feet. The Company in its letter of information continues: " Our price includes all the above, with the lot, and all paving and tree and shrub planting. We want the owner to have no additional expense arising to discourage him in his efforts to acquire a home." (They have however planned a few of the one-story houses so that the attic may later be finished off by the owner into two bedrooms.)

In Pittsfield, Mass., there is a builder who has been attacking this problem with equal interest but on a smaller scale, and with a policy quite different from that suggested in the Beloit company's letter. He wished first of all to provide the house, cutting off the " additional expense " from the price, and letting the buyer of the house add the non-essential improvements as his income permits, possibly doing most of it by his own labor. This policy is illustrated to some extent in one of a small group of houses erected in Pittsfield in 1915 and 1916. Partly because of the smallness of the building operation its construction cost — slightly less than $1700

— does not compare very favorably with the Beloit houses. It embodies a plan of one of the " ready-built " companies discussed on page 12, and is of frame construction with concrete foundation and shingle walls, a porch across the entire front of the house, a small porch at one rear corner and a sleeping porch at the other, all under the same low-hanging roof. The cellar bottom is a layer of three or four inches of cinders on which a cement floor can later be put. On the first floor are four rooms, and a bathroom fitted with bowl, tub, and toilet; the walls are plastered, stock doors are used throughout. On the second floor, the studding of the walls has been left bare, also the studding of the partitions of three potential rooms; these can be finished when and in whatever manner the owner desires.

Another recent housing enterprise is that organized by mill officials and citizens of Danielson, Conn.[1] Though there are a few semi-detached houses costing $1800 per family, the Company has so far erected chiefly detached houses costing $1900 each; these are about twenty-five feet square, with four rooms on each floor, and porch, attic, and cellar. There is hot water in kitchen and bathroom, open plumbing in the bathroom, and electric lights throughout. Floors and wood trim are of Georgia pine with inside walls oil-painted in warm tints. As planned, the exteriors will vary both in style and in material, employing shingles, clapboarding, and stucco.

The endeavor to give as much individuality as possible to each house while securing the economies of large-scale production is perhaps best exemplified in the undertaking at Flint, Mich. Toward the end of 1916, the first 200 foundations were started for detached frame houses to range in cost of construction from $1500 to $2200 and in size from story-and-a-half houses of five rooms to two-story houses of six, seven, and eight rooms, 75 per cent of the houses to be of the five- and six-room sizes. " Each house is provided with a living-room, dining-room, kitchen, and bathroom, and furnished with a hot-air furnace with a water-back, a hot-water boiler, a kitchen sink, and three bathroom fixtures."[2] " The exterior treatment adopted is, generally speaking,

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[1] Information from " Housing the Connecticut Mills Employees " by John Barnard. *The India Rubber World*, March 1, 1917.

[2] Quotations from " The Civic Building Company's Development at Flint, Michigan " by H. E. Davis. *Architectural Review*, April, 1917.

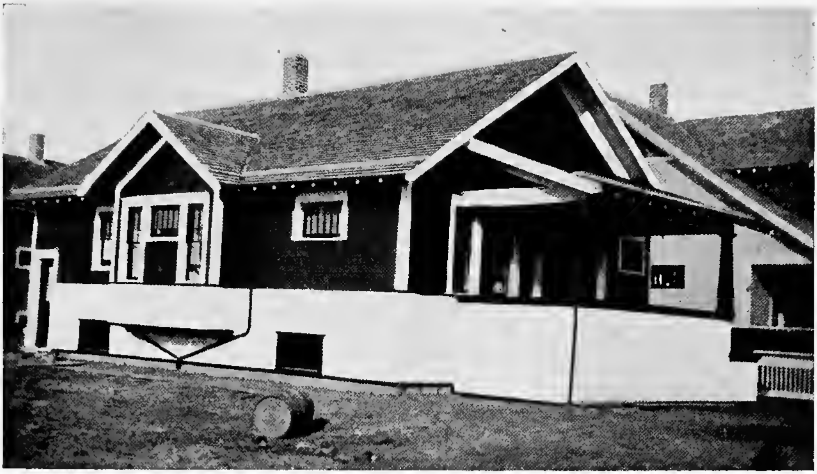

Fig. 4. Five-room house, Kenosha Homes Co., Kenosha, Wis., 1916. (Type E.) Construction cost, $1,700.

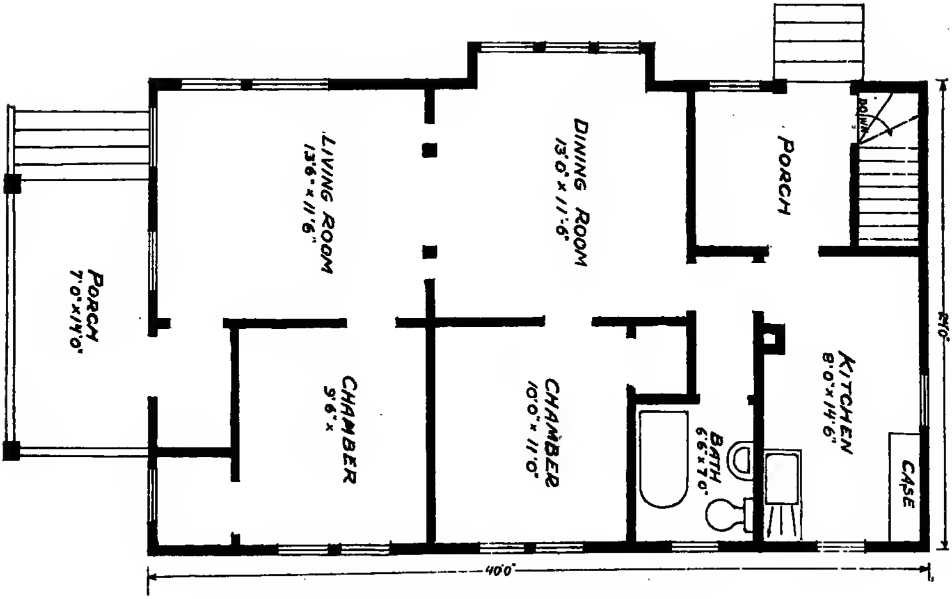

Fig. 4a. Floor plans of Type E, Kenosha, Wis.

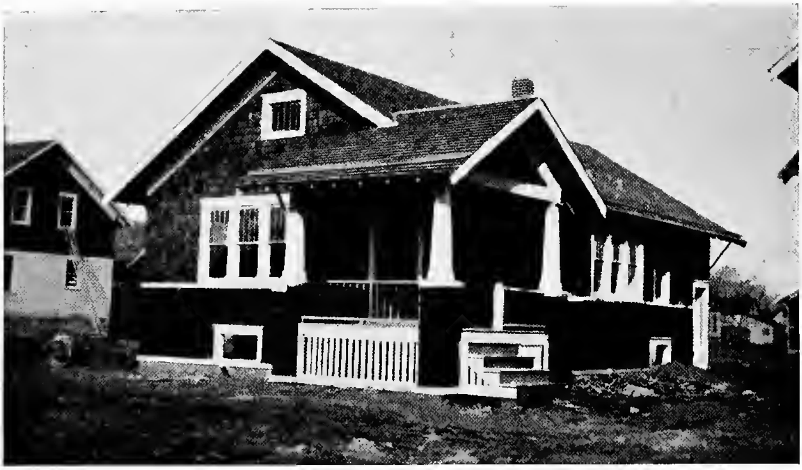

FIG. 5. Five-room house, Kenosha Homes Co., Kenosha, Wis., 1916. (Type F.) Construction cost, $1,700.

of the old New England village type, with the simplest possible roof lines, close eaves, small-paned windows, and blinds. Simple lattice work is introduced here and there to relieve the bald spots, and flower-boxes are used under windows and on the sides of the porches. . . ." "While, for reasons of construction economy, the effort has been made to use a minimum variety of plans, it has also been the endeavor to obtain the maximum possible variety of effect. As a result, twenty-nine exterior designs have been developed, and further variations are obtained by the use of 24-inch shingles 10 inches to the weather, 16-inch shingles 6 inches to the weather, 10-inch siding and 6-inch siding. These materials are still further varied in effect, in the color-schemes to be used, as follows: Shingle houses to be tinted white with green blinds and red brick chimneys, white with brown blinds and gray brick chimneys, cream with brown blinds and gray brick chimneys, gray with green blinds and red brick chimneys, gray with white blinds and red brick chimneys. Clapboard houses to be painted white, cream, and gray, with blinds and chimneys to harmonize. The roofs throughout are to be of a uniform weathered color." As partially shown in Figure 7,[1] "each block has been studied as a whole in order to obtain a composition of roof lines that would be individual to itself, the suggestion of grouping among many of the houses being obtained by various means . . . the group character being further emphasized by harmony of material and color-scheme. The setbacks from the street line vary from 20 to 30 feet, and certain groups of three or five houses are emphasized by being set back, while the rest of the houses in that same block are set forward. Other variations are obtained by the use of different types of blinds, and also by using groups of windows differently arranged, with and without blinds."

The semi-detached frame house has been built by several companies as a variation from the detached cottage to which they have given most attention. Two companies may however be noted that have built semi-detached houses almost exclusively, also one that has made certain interesting adaptations of it. The essential facts concerning these and the other companies from which information has been obtained are given in Chart B.

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[1] Figures 7, 9, 24, and 24*a* are reproduced through the courtesy of the *Architectural Review*.

The Plymouth Cordage Company, North Plymouth, Mass., in its more recent building has confined itself entirely to semi-detached houses, which it prefers to the frame row houses formerly built for its employees. These semi-detached houses (Fig. 8) are shingled, with either hip or gambrel roofs; the foundations are of stone, and the cellar floors of cement. Their cost per family ranges from $1200 to $2000. Each dwelling has from five to seven rooms and bathroom. The tenants depend on stoves for heat and on kerosene lamps for light. There is no provision for hot water; there is however water and sewer connection. The floors are of hard wood in the kitchen and bathroom only, and the walls of these two rooms are painted, while those of the other rooms are usually papered; all ceilings are whitewashed.

The Barre Wool Combing Company, Ltd., of South Barre, Mass., has two general types of semi-detached house (in addition to some row houses), the older having gambrel roofs and shingled sides, and the newer type (built about 1913) having pitch roofs and clapboarded sides. Both styles are two-storied; the latter has seven rooms on each side and costs about $1950 per family. The cellars have a cement bottom but contain no furnace; the heating is by means of stoves, often only by kitchen ranges.

An interesting attempt to meet the needs of the immigrant workers is shown in the detached and semi-detached one-story cottages (noted in both Charts A and B; see Fig. 9) of the American Rolling Mill Company, Middletown, Ohio, built in 1914. The semi-detached cottages have for each family four rooms comprising the narrow kitchen (5′×13′ 4″) opening into the large living-room (22′×13′ 4″) and the bedrooms (17′ 4″×17′ and 10′ 6″×13′ 4″). Each dwelling is lighted by electricity and heated by the kitchen stove. The only plumbing fixture inside is the kitchen sink, as the toilet and the bathing facilities for most of the houses are in out-buildings; a few houses however have concrete basements which contain modern toilets. For the semi-detached cottages the cost for the year 1914 of cottage, lot, and improvements is stated to be $1922 per family.

READY-BUILT FRAME HOUSES

An account of frame construction, the general value of which will be considered in the conclusion, would be incomplete without some mention of " ready-built " houses. The companies which

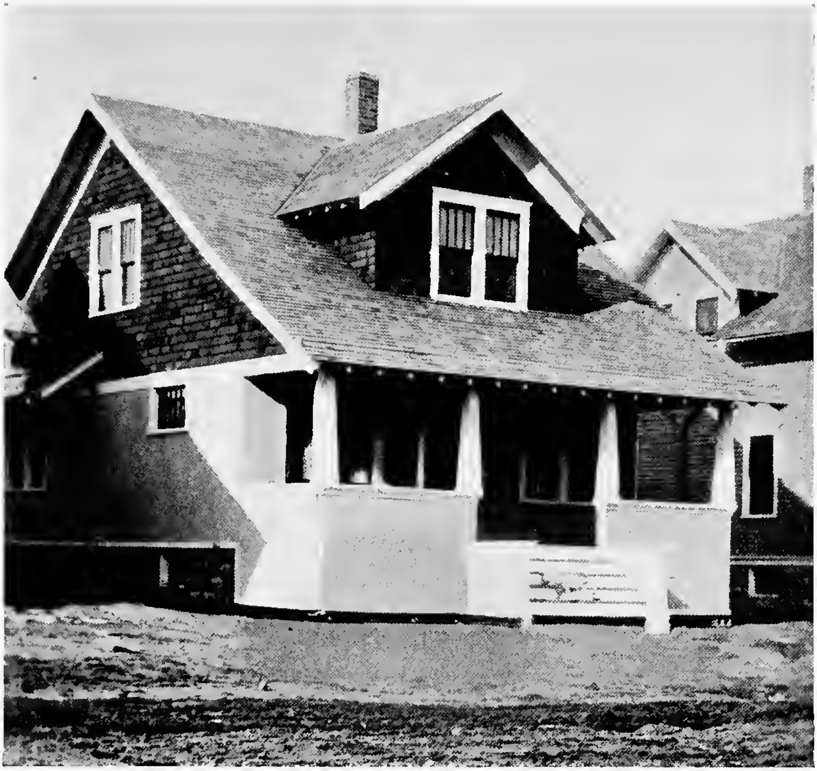

Fig. 6. Seven-room house, Kenosha Homes Co., Kenosha, Wis., 1916. (Type G.) Construction cost, $1,800.

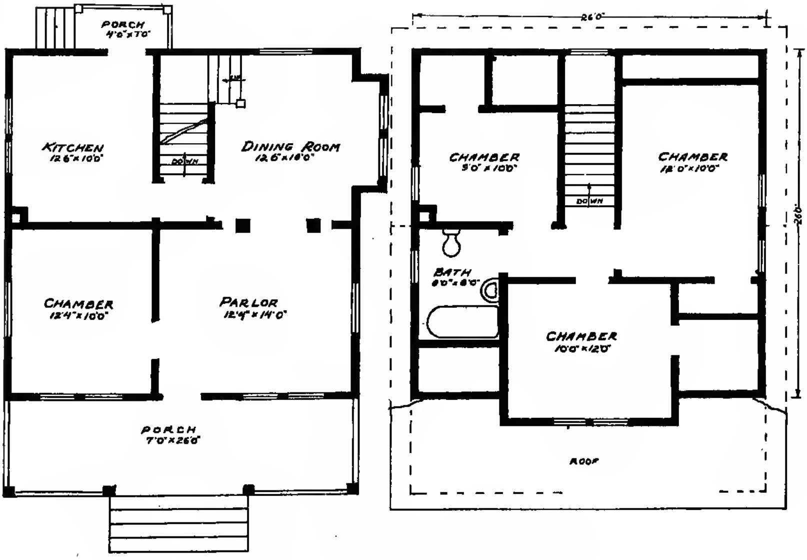

Fig. 6*a*. Floor plans of Type G, Kenosha, Wis.

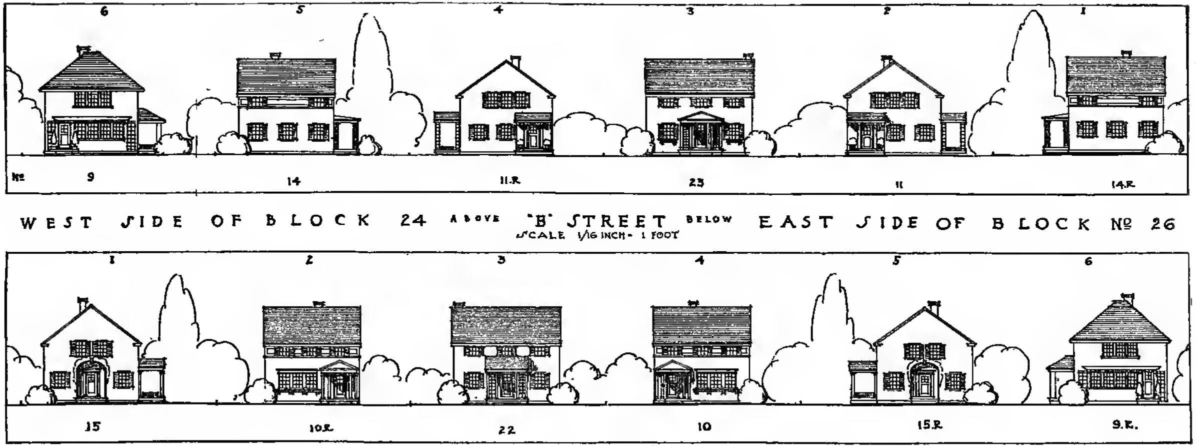

FIG. 7. Example of architectural grouping, Civic Building Co., Flint, Mich., 1917.
Scale of reproduction, 1 inch = 48 feet.

manufacture these houses have several stock plans worked out in detail by their architects. The lumber is cut to an exact fit in the company's mill, and the building materials are shipped to the purchaser who then by his own or by hired labor erects the house. The shipment generally includes all necessary lumber, building paper, windows and doors, hardware, paints, stain, varnish, plans, and erection instructions. A separate charge is made for the plumbing. The materials for the foundation and chimney can usually be secured more economically from local sources and are therefore frequently excluded from the purchase. Often, if desired, metal lath or "Bishopric Board" will be provided for stucco. This method of house construction effects various economies, especially in the amount of lumber used and in labor costs. It may bring to the purchaser of limited means better architectural service than he would be likely otherwise to secure. The prices for house materials run all the way from two or three hundred dollars up to six thousand dollars. If the labor for erecting the house is hired at the average rate of pay, the total cost of the house is roughly from two to two and a half times the price asked by the company for materials.

BRICK CONSTRUCTION

There are two examples of brick construction that deserve detailed notice in this account, — the semi-detached houses of the Salem Rebuilding Trust in Salem, Mass., and the detached and semi-detached houses now being constructed in several towns in the coal mining regions of western Pennsylvania.

In Salem, after the fire of 1912, the Rebuilding Trust built a number of semi-detached brick houses, of which the selling prices were as follows: $3582 for the four-room houses with bath (Fig. 10) or $1791 per dwelling, and $3886 for the five-room houses with bath (Fig. 11) or $1943 per dwelling. Both types rent for $15 a month. "The exterior walls are 8-inch brick, strapped internally; roofs of sea-green slate fastened with copper nails, flashed with copper and lead; sides and faces of dormers, stucco applied to wire lath on wood frame; foundations block granite, exterior doorsills also granite; window sills of sloping brick with copper pan under; party wall brickwork between studs, treatment carried to underside of roof; chimney brick with two 9 × 9-inch flues with lining. Each of the two houses has a living-room, kitchen with pantry alcove, back entry with refrigerator space and stairs to second floor and cellar on the lower floor. The second-floor plan shows in each of the two houses two chambers, small hall and bathroom. All rooms are furred on the exterior walls, lathed and plastered. The under floors are spruce with finished floors of rift hard pine everywhere except in the kitchens, where they are maple. All finished floors are matched and blind-nailed and are laid over building paper. Interior finish North Carolina pine, stained and shellacked. Floors are oiled. Outside doors pine, inside doors cypress. No screens are included. . . . Picture molding put up in the living-rooms. Cellar has an earth floor carefully smoothed and rolled and furnished with coal bins, space for heater, etc. Hardware of brass and porcelain of the strongest and most substantial type. Plumbing fixtures include bathtub of enameled iron and water-closet of syphon-action type, iron sinks in kitchens, and 30-gallon hot-water copper tanks on city pressure with relief valves. Outside finish cypress, except in connection with porch floors, which are rift hard pine, oiled. Painting of lead and oil for all outside work except porch floors and copper. . . . Plaster walls in kitchen, hall and stairways sized and finished in oil paint, three-coat work. The houses are lighted by both electricity and gas, and gas connections are provided in kitchens for gas ranges."[1] Each of the five-room houses, with the same general specifications, has on the first floor a large combination kitchen and living-room, a bathroom, a room usable either as a parlor or as a bedroom, a vestibule with coat-closet, and a passageway to the back door, with space for a refrigerator; on the second floor are three bedrooms. As shown in the photographs, the roof of the four-room type is hipped, that of the five-room house is of the gambrel type with dormers.

The cottages built in western Pennsylvania[2] are of two types, — a detached house of six rooms, three on each floor; and a semi-detached house, in which each dwelling has two rooms on each

[1] Pages 17 and 18 of the *Fourth Annual Report of the Homestead Commission, Commonwealth of Massachusetts.*

[2] As follows:

Pennsylvania Coal and Coke Co., Sides, Pa.	16 houses
Munroe Coal Co., Ebensburg, Pa.	86 "
Ebensburg Coal Co., Ebensburg, Pa.	11 "
Cambria and Indiana Railroad, Stiles, Pa.	1 house
Densmore and Kerr, Lockport, Pa.	15 houses

floor with a small kitchen in a rear extension. In some cases bathrooms have been added. The first type costs $1000 above foundations and the second $1600; the excavating and foundation work is done by the owner at a cost of about $150 per house. The walls are of " Fisklock " brick, the hip-roof of a patent composition, the interior partitions of stud and plaster, the floors of a single thickness of yellow pine, and the interior trim of second quality yellow pine. There are no cellars, and the cost figure given does not include any heating, lighting, or plumbing. The coal mining companies themselves generally wire the houses and furnish the light from their own plants. The rent is about $8 a month.

Brick dwellings about which our data is less complete are the semi-detached houses of John A. Roebling's Sons Company, Roebling, New Jersey. These include forty-eight two-story houses with attic, containing seven rooms, toilet, and shed-kitchen; each renting for $10.50 a month; and twenty-four two-story houses containing six rooms and bath, equipped with steam heat and electric light, having first story walls of plain brick, the second story of stucco; renting for $14 a month.

HOLLOW TILE CONSTRUCTION

Hollow tile has most often been used for fireproof construction of floors and interior walls, but four or five years ago a tile was devised which its sponsors describe as " a new hollow tile with a pleasing exterior surface, something like tapestry brick, warm red in color, at one-third its cost. This tile makes of itself the permanent wall without the cost of the expensive stucco. The unit of tile — 6 × 12 inches face by 6 to 8 inches thick, with double air spaces — will, where properly laid with Portland cement, make an impervious masonry wall, warm in winter and cool in summer." [1]

In 1913 and 1914 a number of hollow tile houses (Fig. 12) were built at Hauto, near Lansford, Pa., for the employees of the Lehigh Valley Coal and Navigation Company.

" Three types of house have been erected:

" 1. *Bungalows:* Each has two double bedrooms, large living-room and a kitchen, with soapstone washtub and sink. There is a center chimney and a water-closet. The cooking range will heat the

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[1] This and the following quotations are from an article, "Improved Housing in a Mining Town," by E. L. Kellogg, of Standard Buildings, Inc., in *The American City* for February, 1915.

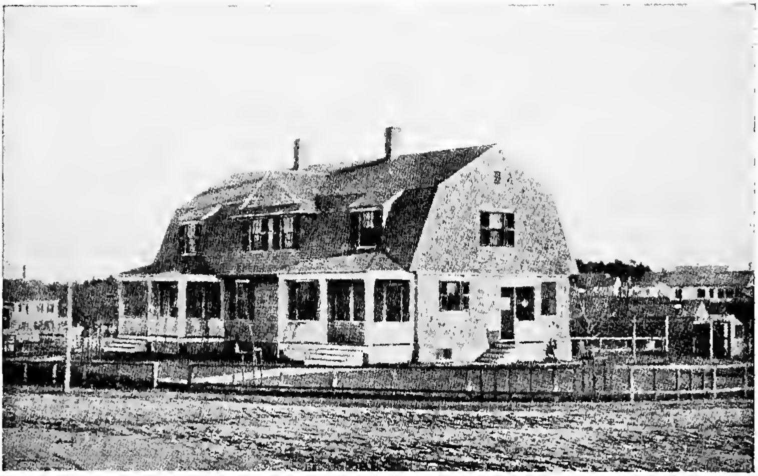

FIG. 8. Seven-room semi-detached dwelling, Plymouth Cordage Co., North Plymouth, Mass.

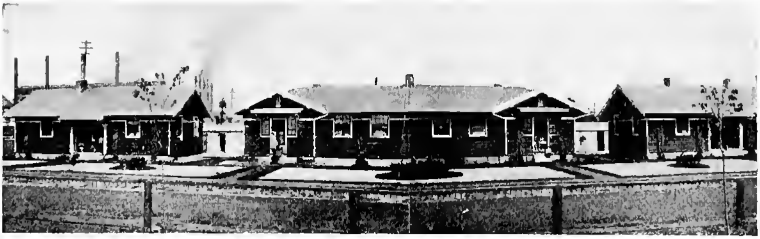

FIG. 9. Five-room dwellings for immigrants, American Rolling Mill Co., Middletown, Ohio, 1914.

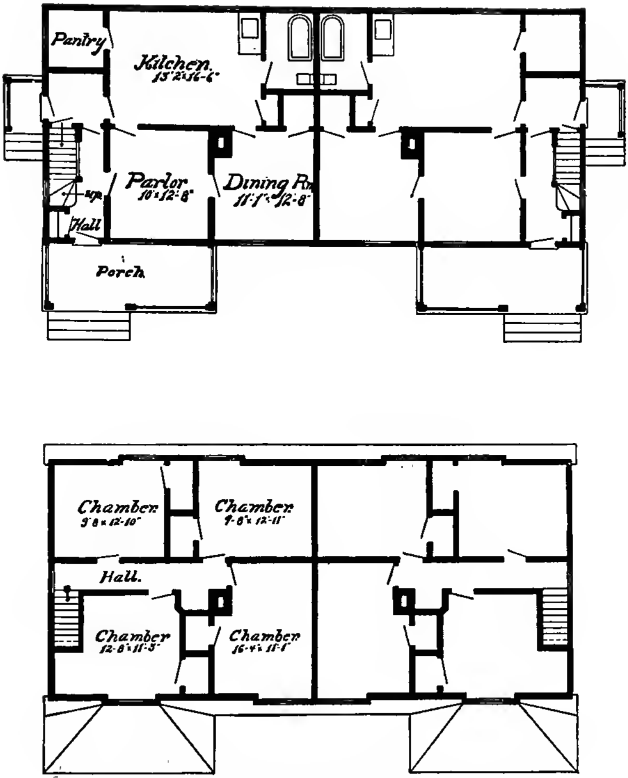

FIG. 8*a*. Floor plans of semi-detached dwellings, Plymouth Cordage Co.

house in winter from its position in the living-room, and in summer can be moved into the kitchen. A large front porch is provided, and a smaller in the rear. In these bungalows the hollow tile is smooth in the interior and is whitewashed, thus doing away with plaster and giving a surface practically proof against wear and tear.

" 2. *Five-room two-story houses* with rooms on the second story full height. Each has a living-room, dining-room, kitchen, two bedrooms, a cemented cellar, furnace, and a bathroom.

" 3. *Six-room houses* are similar, but have a larger living-room and three bedrooms.

" Good closets are provided in all these houses. The five- and six-room houses are plastered in the usual way, with hard white finish for painting." The construction costs in 1913 were as follows: For the bungalow, with no cellar or heat, about $1,100; for the five-room house, with cellar, bath, and heat, about $2,300; for the six-room house, with cellar, bath, and heat, about $1,950.

The Hauto bungalows are the chief example of hollow tile construction with neither exterior wall-covering of stucco nor interior covering of plaster. Hollow tile has also been used in the following types of construction, which are somewhat more expensive than the above, — hollow tile veneer on frame, brick veneer on hollow tile, and stucco on hollow tile (Midland, Pa., Tyrone, New Mexico, Williamsport, Pa.)..

CONCRETE CONSTRUCTION

Concrete is at present used in three forms in cottage construction: first, in the form of concrete blocks, as for instance by Witherbee, Sherman and Company, Mineville, N. Y.; second, in concrete sections, as in the sectional concrete houses designed by Grosvenor Atterbury for the Sage Foundation Homes Company; and third, in the poured concrete house, in which Milton Dana Morrill and other individuals have been actively interested.

The concrete block houses of Witherbee, Sherman and Company, erected since 1904 at Mineville, N. Y., are both detached and semi-detached. Of the former, a six-room house (Fig. 13) with shingle roof is stated to have cost $850 without heat or plumbing (one of this type with a frame barn costing $100 rents for $8 a month). A two-story-and-attic house with six rooms and bath, a cemented cellar, water supply from windmill and well, but no heat, cost $1350 and rents for $9 a month, including barn. Another six-room house cost $1025. Of the semi-detached houses there is one type costing $1325 per family and renting for $8.50 a month; this has seven rooms on each side, interior trim of hardwood throughout, exterior trim of cement brick, roof of Granville sea-green slate, but no heat or water. In all the interiors, one-inch furring strips are nailed to the inside of the block and upon these wooden laths are nailed; pulp plaster is employed; the floors are single, of either birch or maple. All of these houses are lighted by electricity. As shown in Figure 14 rock-faced and plain blocks have been used in different combinations to gain architectural variety.

Concrete blocks have also been used in some of the more recent cottages of the Colorado Fuel and Iron Company, in houses built by the Maryland Steel Company, Sparrows Point, Md., and in houses costing $300 to $350 per room built for the employees of the Ludlow Manufacturing Associates, Ludlow, Mass.

The use of concrete in pre-cast units has grown out of the research work in building construction done by Mr. Grosvenor Atterbury, in coöperation with the Russell Sage Foundation. Mr. Atterbury saw the paramount importance to low-priced housing of devising and perfecting " a standardized, shop-made, and completely finished building unit or section, of maximum economic size," and has developed a mode of constructing sectional concrete houses which has been utilized by the Sage Foundation Homes Company. The first two houses (Fig. 15) erected by this method each contain a cellar, kitchen, dining-room, living-room, three bedrooms, and a bath. The second house cost 11 to 12 cents per cubic foot for the shell, and 16 cents per cubic foot complete. It has a floor area of 18×28½ feet, and is built of 170 separate blocks or forms, consisting of 101 wall window panels, door heads, and chimney blocks, 20 floor blocks, 12 roof blocks, and 37 partition blocks; these blocks are of various lengths and widths, are from eight to ten inches in thickness, and weigh from one to three tons each. After the blocks have been molded (using collapsible cores where air-spaces are necessary) and hardened, they are transported to the site of the building and erected by the use of a traveling crane (Fig. 16). This crane " is operated by electricity and has a capacity of five tons and a radius of action sufficient to cover two houses at once ";[1] by moving longitudinally it can work on any number of houses in a row. The blocks are bedded in mortar which is also run into the tongue and groove joints between the wall joints and binds the whole house together into what is practically a monolithic structure. The roof blocks are made with an overlapping joint, forming a water-tight roof.

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[1] Quotations from " Studies in Economic Construction " in *The Cement Age*, December, 1910.

" Outside of this concrete construction as shown, it is only necessary to put in windows and doors, set the kitchen range and sink, and the plumbing in the bathroom, and tint the interior walls and ceilings an agreeable color to make the house ready for occupancy."

" In all this work the concrete used consists of a good grade of Portland cement, clean, sharp, well-graded sand, all of which passes through a $\frac{1}{8}$-inch mesh sieve, gravel gritts which are held on the $\frac{1}{8}$-inch sieve and pass a $\frac{1}{4}$-inch sieve and gravel, which is held on $\frac{1}{4}$-inch sieve and passes $\frac{1}{2}$-inch sieve, the ordinary proportions being 1 volume of cement, 2 of sand, 2 of gritts, and 2 of gravel. These materials are well mixed with water to a thin paste and poured into the molds. During the pouring the concrete is slightly joggled with long sticks or the molds are jarred with mallets. . . . The wall forms are all constructed of steel, which gives a smooth glossy finish to the concrete. For outside work this smooth finish is left as a border and a panel formed by rubbing the other part with a wire brush to expose the gravel aggregate."

Among Mr. Atterbury's more recent inventions is a substance called " Nailcrete " and used for nailing grounds in the concrete houses.[1] It has 60–70 per cent of the strength and 80 per cent of the weight of concrete, the same coefficient of expansion, does not corrode steel or other imbedded metals, does not swell when exposed to dampness, and is as nailable as white pine. The floor blocks are cast with an inch-and-a-half layer of it and the flooring then nailed to it.

THE " POURED " CONCRETE HOUSE

The mere notion of pouring a house appeals strongly to the imagination — to the American liking for spectacular efficiency. At first the poured house practically required the preliminary building of a frame house, into the hollow walls of which the con-

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[1] Page 292, " Housing Problems in America," the *Proceedings of the Fifth National Conference on Housing*, 1916.

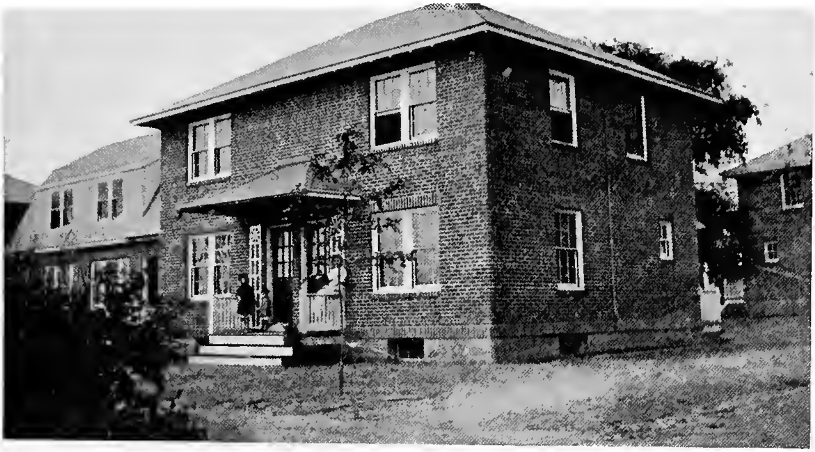

FIG. 10. Four-room semi-detached dwellings, Salem Rebuilding Trust, Salem, Mass., 1915. Selling price, $1,791 per dwelling.

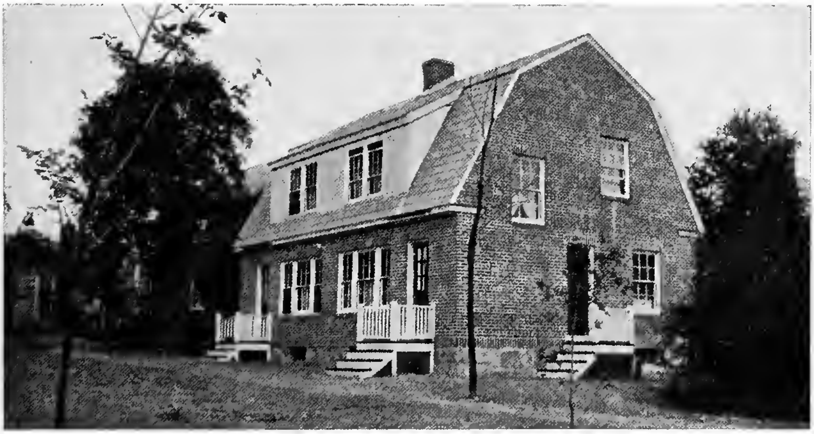

FIG. 11. Five-room semi-detached dwellings, Salem Rebuilding Trust, Salem, Mass., 1915. Selling price, $1,943 per dwelling.

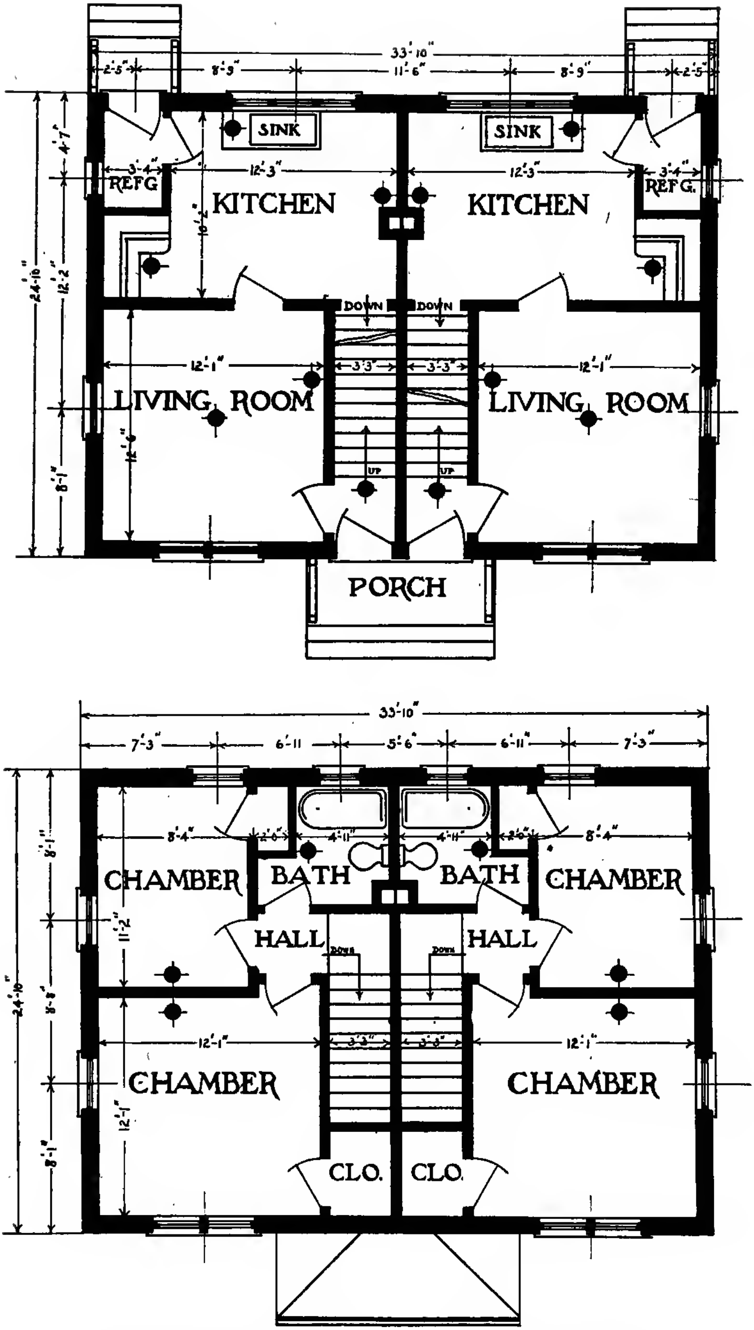

Fig. 10*a*. Floor plans of the hip-roofed houses, Salem Rebuilding Trust.

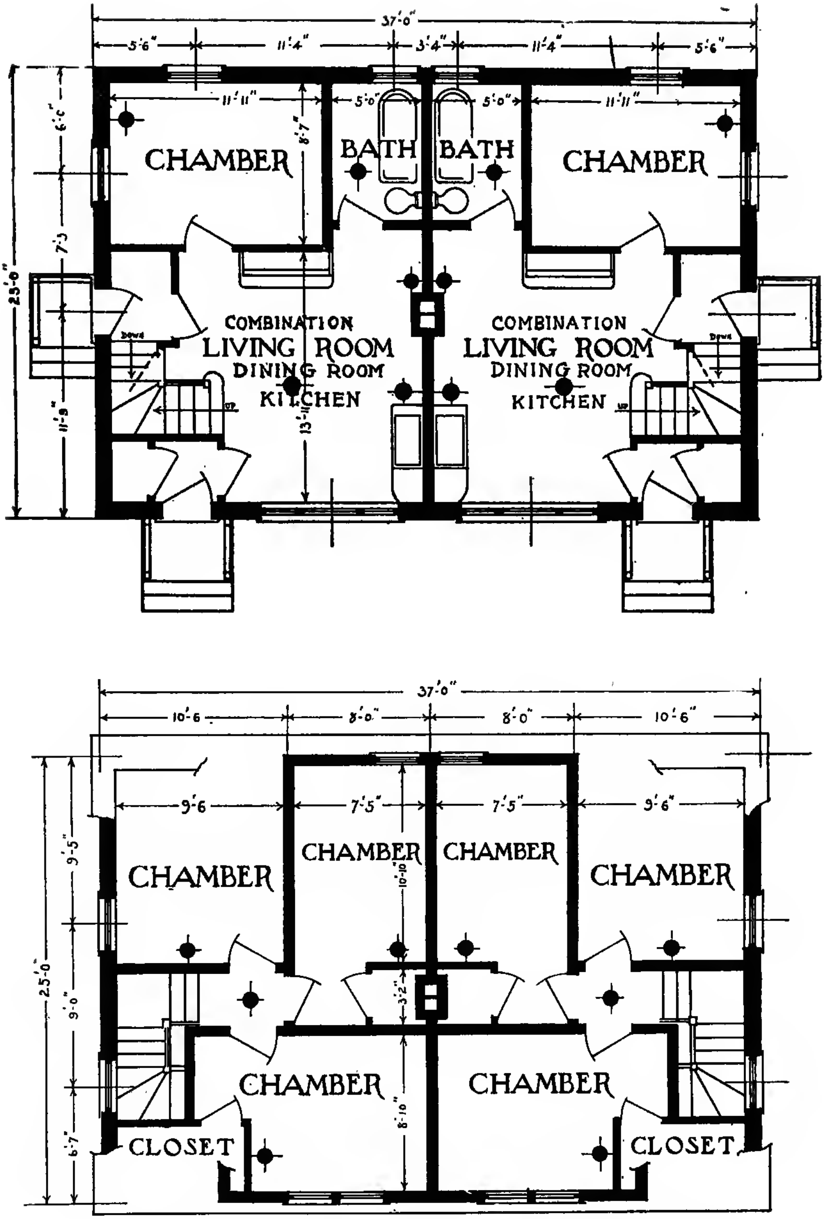

FIG. 11a. Floor plans of the gambrel-roofed houses, Salem Rebuilding Trust.

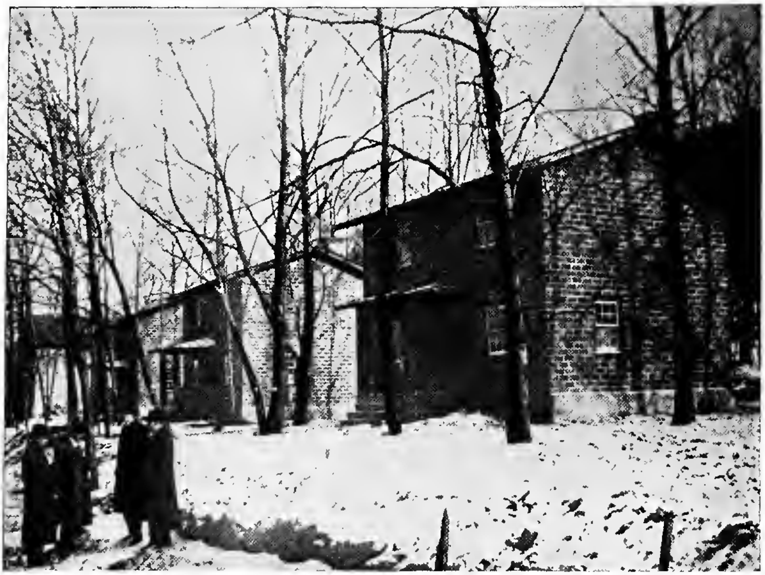

FIG. 12. Hollow tile houses, Lehigh Valley Coal and Navigation Co., Hauto, Pa., 1913 and 1914.

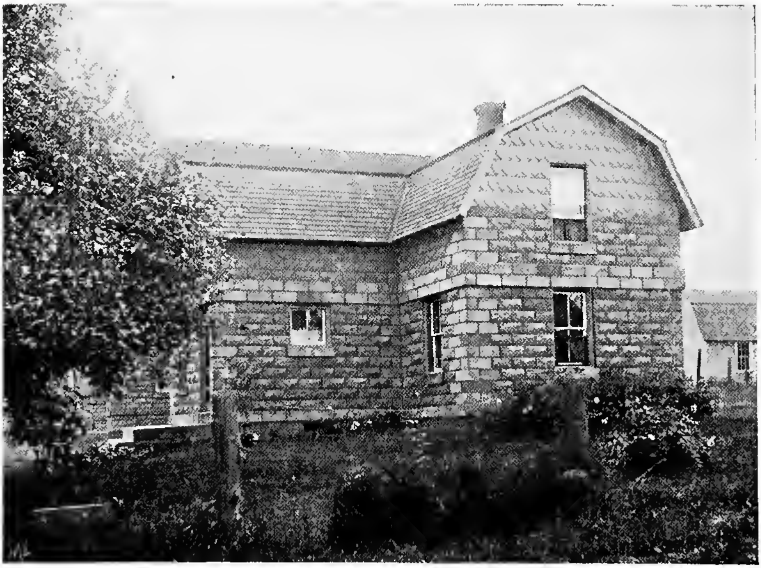

FIG. 13. Six-room concrete block house, Witherbee, Sherman and Co., Mineville, N. Y. Construction cost, $850.

crete might be poured; the cost of lumber and carpenter labor was about three times that of the concrete itself. Later, standardized steel molds replaced the wooden framework. The equipment as devised by Thomas A. Edison, the prophet of this development, consisted of heavy cast iron molds costing about $25,000 for each house design. In Midland, Pa., a few poured concrete houses which were constructed for experimental purposes from Edison molds rented for $14 a month and sold for $1900 with lot. They have concrete walls and floors throughout, four rooms with inside toilet, running water, electric light, and gas. But the method of using specialized cast-iron molds for a particular type of house would generally be impracticable because of the very limited use to which any given set of molds could be put, resulting in high cost per house. If used on a large enough scale to reduce the cost per house, the alternative result would be extreme monotony of appearance.

About 1908, however, Milton Dana Morrill brought out an invention of adaptable steel molds. As later worked out, an equipment of pressed steel plates costing $625 sufficed for the construction of a large number of houses of various types and dimensions. These plates are of $\frac{1}{8}$-inch cold rolled steel pressed into standard unit plates two feet square. All connections are of a wedge type, requiring only a hammer for assembling. "The 'Morrill system' includes two tiers in height of flanged plates, keyed together by perforated straps and spacing pipes, forming a trough like a box-girder, which is poured full; after the upper tier is poured full and the concrete allowed to set for a few hours, the lower tier of plates is disconnected at the joints and each side is swung up by an ingenious system of hinge bars, forming a new trough on the top, which is again poured full."[1] As these forms are raised or swung up, the window and door frames built out to the thickness of the wall are dropped into the forms with a strip nailed on the back, and the concrete poured around them.

Many of these houses have concrete partitions and concrete floors, the latter in some cases being surfaced with wood flooring, in other cases having the cement finish trowelled smooth and painted. "A damp-proofing is mixed in the concrete and in colder climates where houses are to be occupied in winter, blocks are bedded in the walls to which furring strips are attached, just as is done in brick and stone."[1]

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[1] From "Poured Houses for Land Development," in the *National Real Estate Journal*, April 15, 1912.

The Morrill system has been utilized at Virginia Highlands, near Washington, at Brentwood, Md., at High Lake, Ill., at Nanticoke, Pa., and elsewhere. One of the poured houses at Virginia Highlands is shown in Figure 17; it is 23×25 feet with 7-foot porch, has six rooms, a bath, and a furnace, and cost less than $2000 to build. The Brentwood house (Fig. 18) of four rooms and bath contains no woodwork except sash and doors and cost in groups $1500 to build; it can be flushed out with a hose and is so built that the waste heat from the kitchen range may warm the house; the sink and washtub in the kitchen and the bathtub, wash-basin, and water storage tank in the bathroom were cast in cement. The houses built at High Lake with the use of Morrill molds were notable for both cheapness and speed of construction. The cost of labor and material for building reinforced walls six inches in thickness was eight cents per square foot, being thus cheaper than frame construction; the complete 7-foot cellar, walls, and gables for each bungalow were poured in from four to six days.

The twenty semi-detached houses (forty dwellings) at Nanticoke, completed in 1912 for the employees of the Delaware, Lackawanna and Western Railroad, were built entirely of cinder concrete, the mixture being one portion of cement, two of sand, and four of ashes or cinders; they were water-proofed by using hydrated lime to the extent of 10 per cent of the weight of the cement. The roofs are covered with 4-ply slag roofing. The construction of these houses, which are grouped around a central playground 300 ×600 feet (Fig. 19), involved certain large-scale improvements in method. A railroad track was laid around the entire group, and a mixing plant was then mounted on a flat car which held also an elevator for hoisting concrete and was followed by cars of sand, cement, and cinders. The concrete was hoisted from the mixer to an elevated hopper from which spouts conducted the mixture into the steel forms at the various parts of the building. (See Fig. 20.) After a section of one house had been completed the mixing train moved on to the next and the process continued. Each dwelling has six rooms (no bathroom) and rents for $8 a month; it cost about $1160 to build. Window boxes and shrubbery (Fig. 21) have been used to relieve the architectural monotony of the buildings.

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[1] From "Poured Houses for Land Development," in the *National Real Estate Journal,* April 15, 1912.

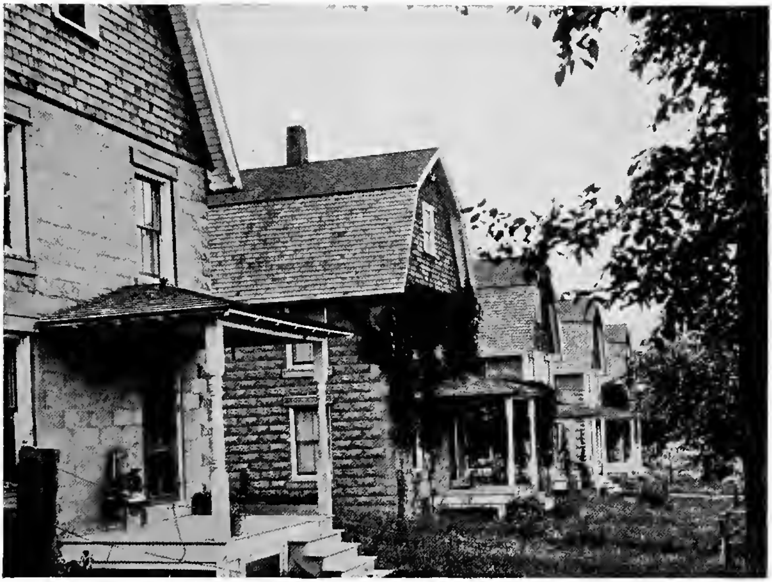

Fig. 14. Concrete block houses at Mineville, showing use of smooth and rock-faced block. Construction cost, $1,350.

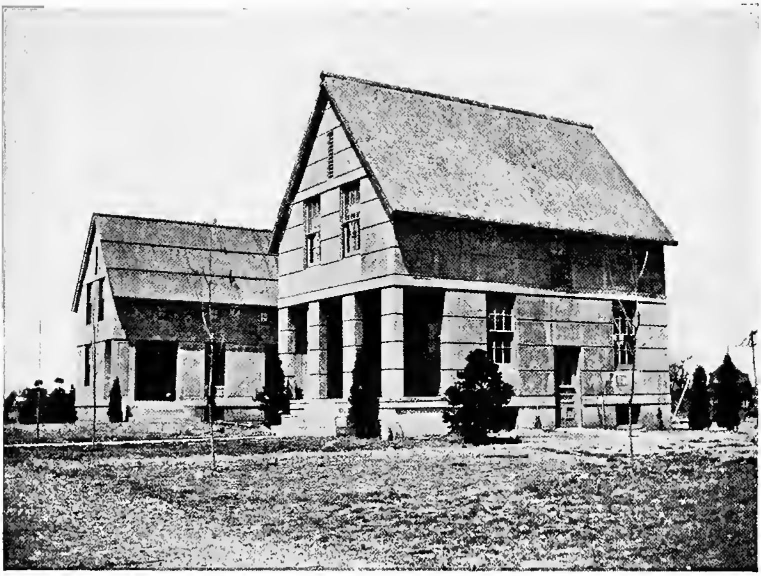

FIG. 15. Sectional concrete houses, Sage Foundation Homes Co., Long Island.

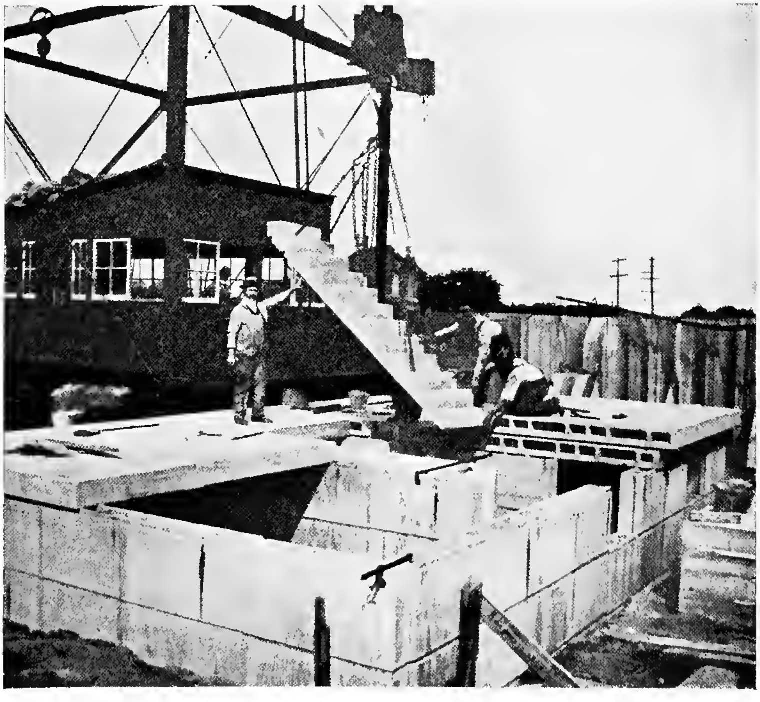

FIG. 16. Erection of sectional concrete houses by use of travelling crane.

In order to indicate the detailed costs of poured concrete construction under present-day conditions, Mr. Morrill prepared (April, 1917) for this study the following table giving an estimate of the cost of the four-room cottage illustrated in Fig. 22.

ESTIMATE OF COST IN A FOUR-ROOM COTTAGE WITH CONCRETE WALLS

Excavation foundation and wall trenches	$10.00
500 lin. ft. ⅜-in. reinforcing steel at 4½ cts. per lb.	11.25
900 sq. ft. 6-in. concrete wall 1–2–4 mix: Cement, $40.80; stone, $15; sand, $7.50; labor, mixing and placing, $34; setting forms, $36	133.00
395 sq. ft. 10-in. foundation 1–2½–5 mix: Cement, $24; stone, $11.50; sand, $6; labor, $12; setting forms above grade, $4	57.50
1020 sq. ft. one coat dash stucco	20.00
1742 board ft. framing timber at $40; labor, $20 per M.	104.52
Bridging	6.00
1625 sq. ft. sub floor and roofing sheathing, at $31; labor, $10 per M.	66.62
120 lin. ft. exposed beam cornice at 20 cts.	24.00
8 complete windows in place at $10 each	80.00
10 complete doors in place at $10 each	100.00
31 sq. yds. furring at 15 cts.	4.65
300 sq. yds. plastering at 50 cts.	60.00
900 sq. yds. tar and gravel roof at 25 cts. per sq. ft.	22.50
400 lbs. nails at 5 cts.	20.00
Staining woodwork and painting sash	50.00
Plumbing	250.00
Electric wiring, $15; drop-cord fixtures, $10.	25.00
Quarter-round base mold	20.00
Fireplace and chimney	50.00
Outside steps	15.00
Vents under floors	6.00
Vents, etc., in gable ends	25.00
Grounds	10.00
Paper over sub floors	4.00
Coal box	8.00
Insurance and liability	20.00
Rental of steel forms, mixer, etc.	30.00
825 sq. ft. 2½-in. T. and G. flooring at $40 per M; labor, 2½ cts. per sq. ft.	53.00
	$1286.04

"The above estimate is based on labor at $2.50 per day of 8 hours, carpentry labor at $4.

"Portland cement at $1.60 per bbl.; stone at $1 per yd.; sand at $1 per cu. yd.; reinforcing steel at 4½ cts. per lb.

"It is assumed that the cottage is one of ten or more built at one time and at one place, so that building material can be bought at wholesale prices.

"The above figure is based on first-class construction throughout and includes a building with a 6-in. reinforced wall lined with furring strips on the inside just as is customary in brick and stone houses. This construction affords a house that is warm in winter and cool in summer. The estimate includes double flooring with building paper between."

There are other makers of steel molds who share in the attempt to apply that method to low-priced housing. With the forms of one firm, the Lambie Concrete House Corporation of New York, a complete story — side walls, partition walls, and floor — is cast at one time; nevertheless the steel forms are freely adaptable and can be applied to a wide variety of types of construction. These forms have been used in building some semi-detached houses at Youngstown, Ohio, and have been more recently employed by another company to build some houses at Donora, Pa.; because of the recent extreme increase in the cost of steel and cement and to some extent in the price of labor, these houses cost (April, 1917) about $3000 each. The Schub system of metal molds by which a single story is cast at one time has so far been applied more to the construction of expensive residences. The Van Guilder Hollow Wall Company of Rochester, N. Y., has developed a variety of hollow wall machines and attachments, for the erection of any kind of building at a cost for the double concrete wall (each wall 4 inches thick with 2½ inches continuous air space between them) of eleven cents per square foot — twelve cents, reinforced. These hollow walls are ready to stucco on the outside and plaster on the inside. This firm's "General Builders' Outfit" costs $175. The steel forms of the Reichert Manufacturing Company, which were used in 1911 in building the concrete houses at Gary, Indiana, for the American Sheet and Tin Company, are like the Morrill forms in having standard units two feet square, but unlike them in that usually one story is set up and cast at one time. Of the Gary houses, the fourteen that are detached cost $3000 each, but it has been figured that they could be built in quantity for from $2000 to $2500 each. Neither stucco nor plaster was used; stain was applied to the inside wall and ceiling surfaces and liquid cement coating to the exteriors. The roofs are of tin supported on wood framework.

In Fairfield, Ill., there are fifteen cottages erected at a cost of $800 each by the Sexton Mfg. Co., for its young women employees. The cottages are one-story high, 25×28 feet in area, with hip-roofs

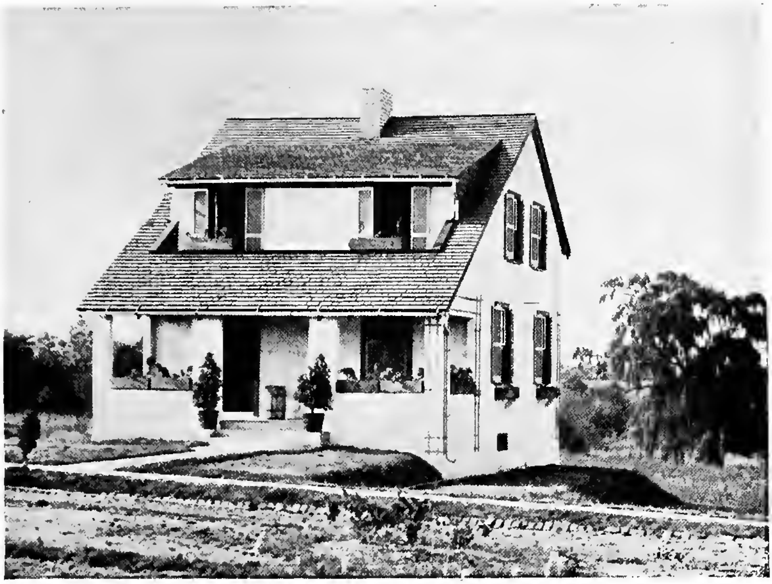

Fig. 17. Six-room poured concrete house, Virginia Highlands, Va. Selling price with 50′ × 100′ lot, $2,600.

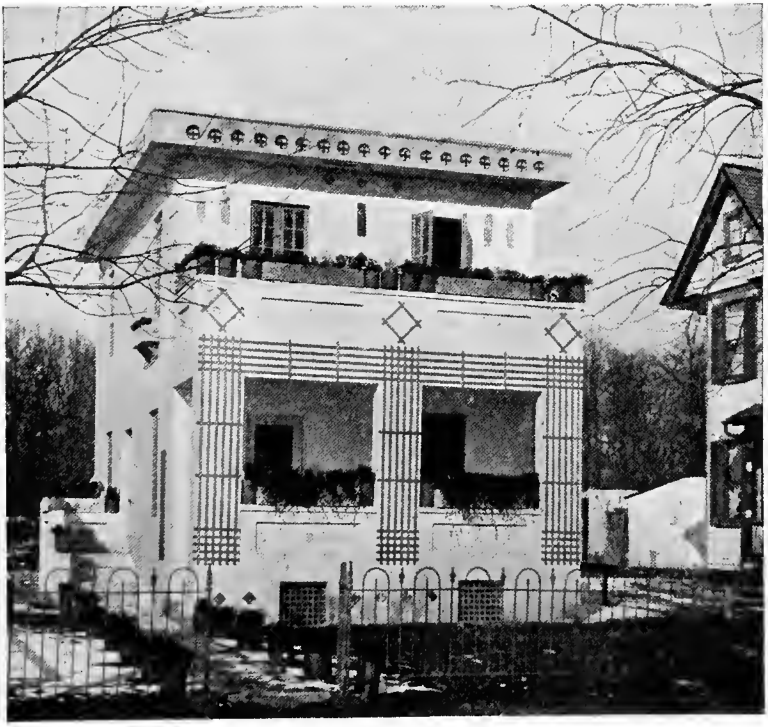

Fig. 18. Four-room poured concrete house, Brentwood, Md. Estimated cost in groups, $1,500.

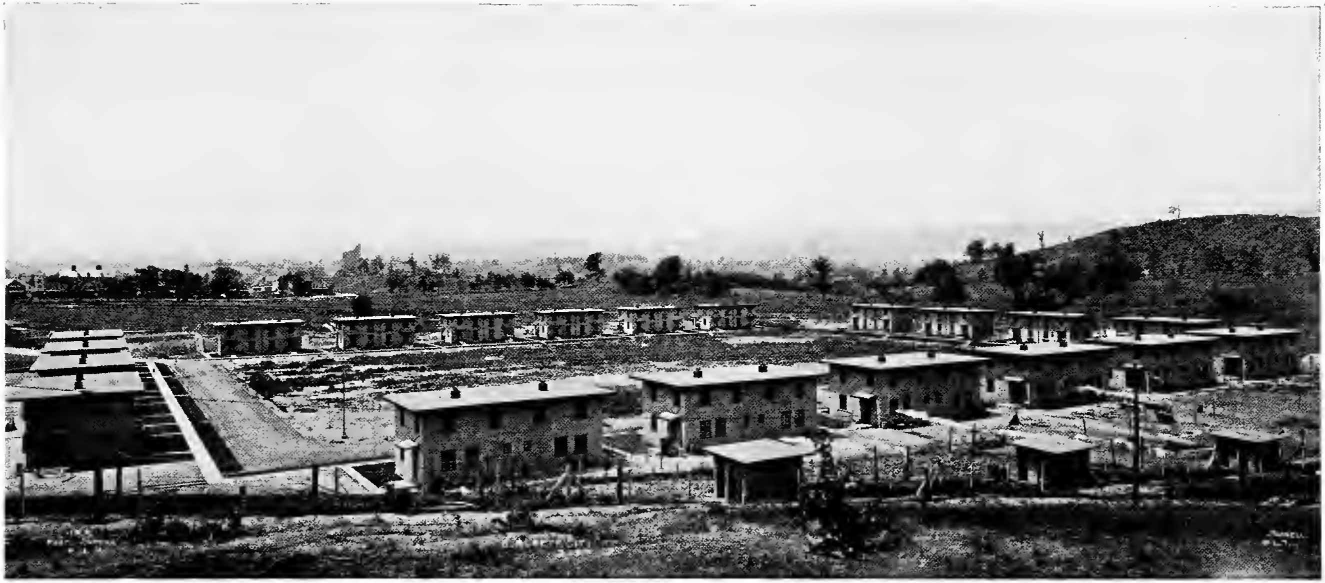

FIG. 19. "Concrete City," Delaware, Lackawanna and Western R. R., Nanticoke, Pa., 1912. Six-room semi-detached dwellings; construction cost, $1,160 per dwelling.

of one-third pitch, no cellar, and a covered porch 7×18 feet; they each contain four rooms, bath, and large hall. All the rooms are used for sleeping purposes, two girls to a room; there is a central dining-hall and reception hall elsewhere. The walls, porch floor, columns, and roofing tiles are of concrete. Wood trim is used for the interior finish. Each cottage has electric lighting and complete plumbing, with steam heat provided from a central plant.

An unusual combination of structural methods is to be found in two bungalows built by the Albany Home Building Company about 1912, selling for $1900 and renting for $17 a month. (See Fig. 23.) The walls are of concrete slabs which were cast on the floor and set in position with a derrick; all vertical joints were cast hollow and after erection were filled solid with liquid concrete. The walls were furred and covered with "Beaver Board" without plastering; the ceilings are likewise of "Beaver Board." "The floor construction is tile with steel and concrete joists and a wood top floor laid on strips concreted in. The interior partitions are of fireproof plaster blocks."[1] One of these bungalows when visited in 1916 showed signs of a settling of part of the foundations leaving cracks between the baseboard of the middle partition and the flooring; the walls had proved themselves to be ready conductors of cold in winter time — also to be formidable obstacles to the installation of wiring for a telephone.

THE USE OF STUCCO IN CONSTRUCTION

Stucco may be used on frame with either wood or metal lath, or on brick, or hollow tile, or concrete. Sometimes it is employed for the sake of variety in undertakings where the prevailing mode of construction is frame shingled or clapboarded; instances of this are the houses built or to be built at Kenosha, Danielson, and Beloit.

In the process of developing the industrial community at Goodyear Heights, the Goodyear Tire and Rubber Company planned a number of different styles of cottage, detached and semi-detached, to be executed in stucco, brick and stucco, stucco and shingles, and brick and shingles. Not all the plans have been used, and most of the estimated costs come above the $2000 limit; in Figure 24 is shown a frame and stucco cottage, 26×28 feet, with six rooms and bath, erected in 1913 at a cost of about $2500, on a lot, 50×110 feet, which cost $500 with improvements.

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[1] From *History and Development of the Albany Home Building Co.*, Albany, N. Y., December, 1912.

Similarly expensive examples of stucco construction are the semi-detached houses at Midland, Pa., built of stucco on hollow tile and selling for about $2800 per dwelling.

Two cases where stucco has been used in the entire enterprise are those of Hanover, Mass., and of Elmira, N. Y. At Hanover, Mass., about thirty houses of stucco on " Bishopric Board " were built in 1913 and 1914 for the E. H. Clapp Rubber Company at a cost of $1753 each, but the stucco was imperfectly made, has since been falling off, and has gradually had to be replaced by shingles. At Elmira, N. Y., about 300 houses, also of stucco on " Bishopric Board," have been built by the Chamber of Commerce at a cost of approximately $2000 each.

CONCLUSION

Two correspondents in writing of the particular building material in which they were most interested declared themselves as follows, — one that " brick is the ultimate house-building material for America just as it has proved to be for Europe," the other that "the whole housing problem has been settled through the use of reinforced concrete and of metal molds." It is impossible as yet to prove any one material to be universally the best to use. The obvious solution is the economical use of whatever material has proved suited to the particular local conditions. Progress is however much assisted by experiments in new materials and new plans by self-confident pioneers.

A knowledge of the comparative costs of the various building materials is important in estimating their relative fitness for different building undertakings. The cost figures given in Chart C have been collected and averaged together in the expectation that the prejudices and errors in the constituent individual tables will go far to neutralize each other. Because of their incompleteness they can be merely suggestive and are not entitled to carry the weight of authority. The conclusions suggested are, shingles are slightly more expensive than clapboards — and worth it, because of their more pleasing appearance and smaller maintenance cost through not requiring periodic painting; brick is about 7 per cent more ex-

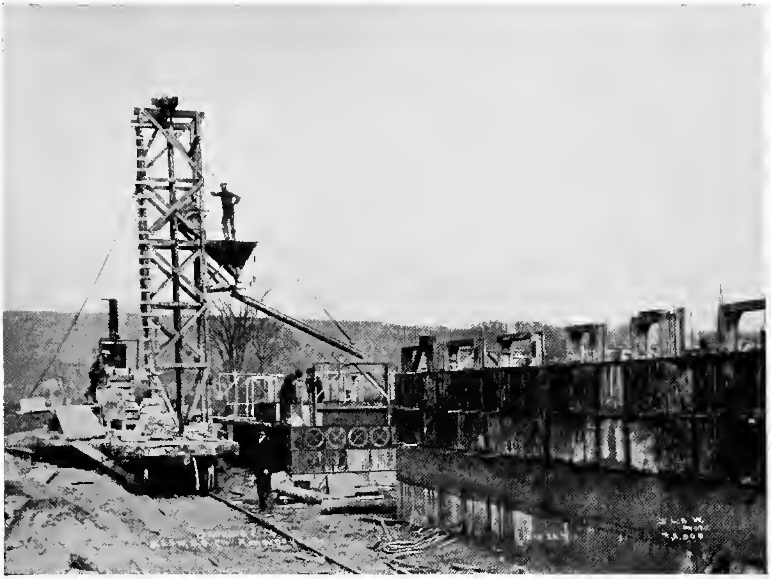

FIG. 20. Process of pouring concrete between inner and outer metal plates. Nanticoke, Pa.

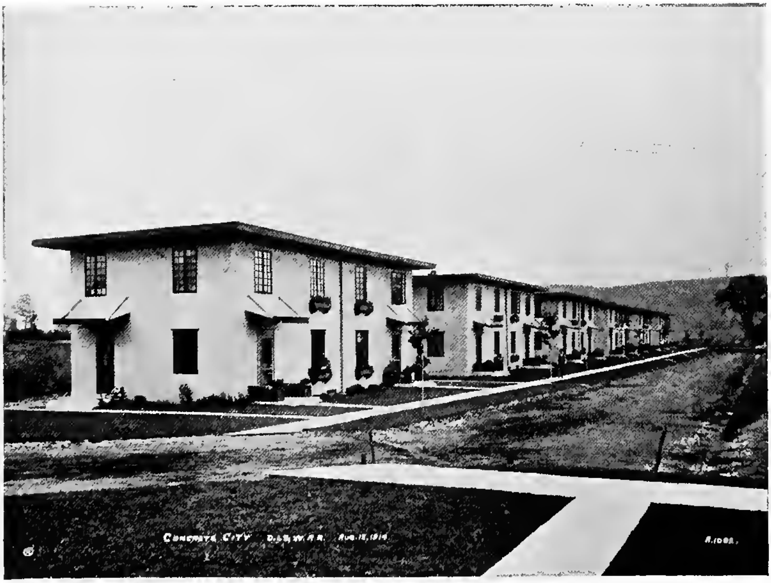

FIG. 21. Completed houses, with improvements. Nanticoke, Pa.

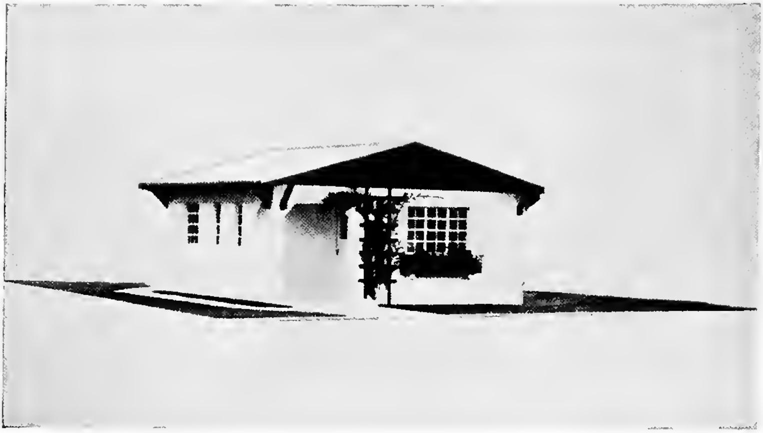

Fig. 22. Model of four-room cottage that can be constructed of concrete poured by the Morrill system at an estimated cost of $1,286.

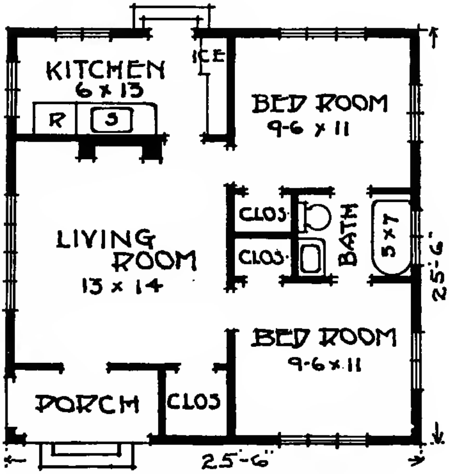

Fig. 22a. Floor plan of the above.

pensive than frame (clapboarded), stucco on metal lath is about 3 per cent more than frame, and concrete is too scantily represented to be compared. But the figures in Chart C are simply the first costs, and the advocates of clay and cement products emphasize chiefly their negligible maintenance costs, though users of concrete sometimes claim to have underbid frame construction at the outset. On that last point the available information is not consistent. With maintenance costs should be considered the other essentials, — general comfort and architectural adaptability, and the non-conductivity of moisture and of heat or cold.

(1) *Frame.* In the case of certain Pennsylvania miners' houses the depreciation was 2½ per cent annually plus the usual repairs;[1] an appraisal of Wilmington, Del., found that the depreciation on frame buildings was 3 per cent, while that on brick buildings was only 1 per cent. The painting and repainting of clapboarded houses is both a first cost and a maintenance cost from which the other modes of construction are comparatively though by no means entirely free. While fairly impervious to moisture because of the air-space between the siding and the interior plaster, frame walls are not as nearly perfect non-conductors of heat or cold as are other forms of construction; hence a greater expense for fuel. Also, because of inflammability, the expense of fire insurance must figure in maintenance cost. On the other hand, frame construction because of its cheapness and simplicity can be resorted to at any time in the year when there is an immediate need of additional housing. Though requiring repairs most often, frame lends itself most readily to alterations and permits large freedom in architectural treatment. Because of its resiliency under-foot frame is also more comfortable than types of construction that involve monolithic floors. In certain coal mining communities frame construction has been favored because of the danger to rigid types of construction from any subsidence of the ground when mining operations are carried on underneath the miners' dwellings, also because coal mining seems too temporary an enterprise in any particular locality to justify investing in more permanent dwellings. But, as the cost of lumber continues to increase and as the normal price of clay and cement products and of apparatus for their use decreases, frame construction is likely to take a less and less important position in low-cost housing.

[1] From address of P. R. MacNeille, p. 77, *Proceedings of the Fifth National Housing Conference*, 1916.

(2) *Brick* has a comparatively high initial cost but very low maintenance cost. Its various possibilities as to color, surface, bond, mortar, and its gain in appearance through aging, give it decided aesthetic value, and its protection against moisture and heat or cold when furred or built with a hollow wall make it emphatically superior to frame construction in that respect. An interlocking channel brick such as the "Fisklock" Tapestry brick, costs little but provides a hollow wall with a brick face; the two walls are each three inches thick, separated by a two-inch air space but bound together by webs integral with the brick itself. Since there are usually no "through" mortar joints with Fisklock brick, furring and lathing are unnecessary.

(3) *Hollow Tile.* As with brick, so with terra cotta hollow tile, the maintenance cost is next to nothing, and resistance to heat and cold is great. When the mortar is water-proofed, the only danger from dampness would lie in the possible openings between the tile and the window and door frames or in the transmission of moisture along stone or concrete extending through the wall; the remedies here are caulking, and water-proofing with some bituminous coating. As indicated, hollow tile may be left bare both inside and out; it may be plastered or stuccoed or both, without furring. Altogether, it is a close rival of brick, though not yet made in as convenient sizes.

(4) *Concrete.* In block form, concrete is convenient and cheap (cheaper usually than the one estimate in Chart C would indicate), but its common representative, the "dry-process" block, is made hastily and consequently with too little water, and is thus neither durable, impervious to moisture, nor a safe basis for stucco.[1] And concrete blocks are generally conceded to have little artistic merit, especially when rock-faced. Concrete hollow tile, however, is made with sufficient water and is light in weight, strong, durable, and fairly cheap to make. Its large air cells increase the insulation against cold, and its dense texture adds to its weatherproof qualities. Since the expansion coefficients of concrete and stucco are approximately the same, changes of temperature do not affect the bond, and stucco therefore adheres more readily to concrete than to terra cotta.[2]

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[1] Pages 50–52, *Concrete and Stucco Houses*, by Oswald C. Hering. New York, 1912.

[2] *Ibid.*, p. 54.

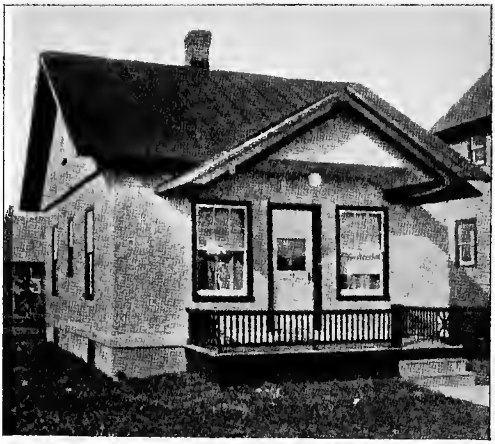
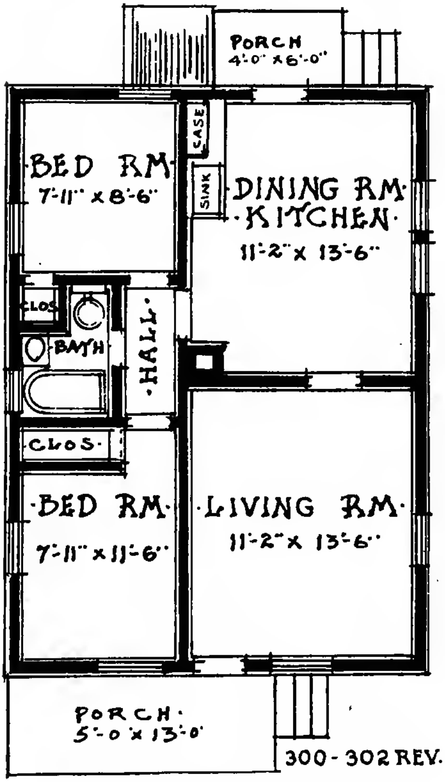


Fig. 23. Four-room cottage, Albany Home Building Co., Albany, N. Y., 1912. Selling price, $1,900.



COTTAGE No. 302

Fig. 23*a*. Floor plan of the above.

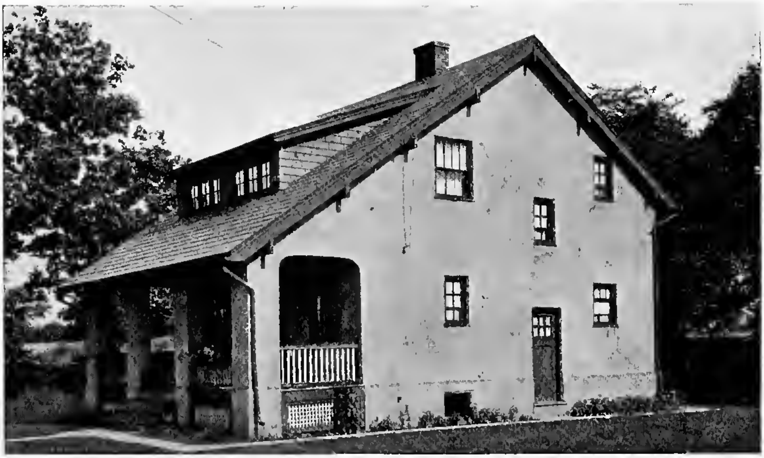


FIG. 24. Six-room stucco cottage, Goodyear Tire and Rubber Co., " Goodyear Heights," Akron, Ohio, 1913. Estimated construction cost, $2,500.

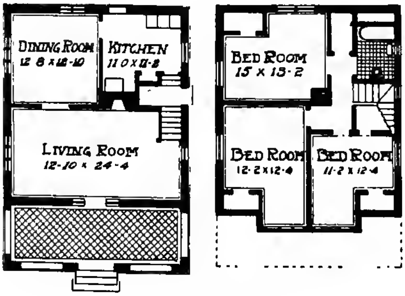


FIG. 24*a*. Floor plans of the above.

While the concrete block or tile represents standardization of the structural unit and "poured" concrete embodies standardization of the structural method and tools, the system of concrete sections seems to combine the expenses rather than the economies of both kinds of standardization. It requires elaborate and costly molds in which to cast the sections, and the expense of buying or even renting the traveling crane necessary in that mode of construction is such that a large number of houses must be built in order to keep low the overhead charges per house.

Poured houses have a fairly low first cost and a negligible maintenance cost, are vermin-proof (though in that respect little better than brick or hollow tile houses), and because of the non-conductivity of the walls are generally warm in winter and cool in summer. The chief point of dispute is as to the danger from dampness. If two essential requirements in the making of concrete are met, it should be a sufficiently compact mass to be proof against moisture; the two essentials are, — that plenty of water be used, and that the amounts of the various ingredients be properly proportioned so that there will be just enough cement to fill all the voids in the sand and just enough sand and cement combined to fill all the voids in the gravel or whatever other aggregate is used.[1] Or the concrete may be water-proofed by the integral method of mixing with the cement patented powders, pastes, or liquids, or by coating with some bituminous preparation. A protective air-space may be secured by pouring the walls hollow or by furring and plastering.

Two other criticisms of concrete are that the rigid hardness of concrete floors injures the feet, and that when the concrete house is once built it is both difficult and costly to alter it or to introduce new wiring or piping into the walls; both criticisms can be partially met, the former by the use of rugs or of wood or cork floors laid on the concrete, the latter by introducing at the time of erection sufficient piping and conduits for later extensions.

Architecturally, the poured concrete house has decided possibilities so long as it is considered independently of the conventions required by other building materials.

(5) *Stucco* may be either the superficial layer on a wall of brick, hollow tile, poured concrete or concrete block, or it may be applied

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[1] Page 13, *Concrete and Stucco Houses*, by Oswald C. Hering. New York, 1912.

as a veneering on wood lath or on metal lath without wood sheathing as the most substantial part of the wall itself. In the former case the shelter-value of the wall depends mainly on the material of which the stucco is the veneer; in the latter the stucco is itself the chief factor.

The especial importance of having stucco properly made and carefully applied in order to secure its full measure of durability has already been indicated. Its cheapness and resistance to dampness may be increased by the use of some patent stucco board. So long as the stucco is on wood lath or the lath on wood sheathing, a danger still remains, namely, that the stucco will crack because of the fact that changes in temperature have opposite effects on wood and on stucco, one contracting when the other expands. The likelihood of cracking can be lessened by the use of metal lath — either close-meshed wire lath or expanded metal lath; much metal lath is now manufactured with raised ribs, by which the lath is fastened directly to the sheathing and furring is thus eliminated. Even the sheathing itself may be done away with by using rib-reinforced metal lath, on which the stucco is plastered both front and back, forming a solid slab of reinforced Portland cement mortar two inches in thickness. Solid stucco costs a little less than stucco on hollow tile, cement block, or brick.

Stucco if well made and well applied is fairly cheap, quite durable, fire- and vermin-proof, fairly damp-proof, imperfectly resistant to heat and cold. It is capable of quite artistic surface treatment, because of the six or seven different finishes and the various color possibilities from either tinting the cement or using aggregates of colored stone.

Frame construction then seems likely to decrease because of the generally increasing cost of lumber as compared with that of clay and cement products, and because of the fire risk and high maintenance cost of frame houses. But in many localities wood still remains cheaper than other building materials. It will also tend to be used wherever social changes are occurring so rapidly that a more permanent type of dwelling would be an unprofitable investment. Brick is to be recommended wherever local conditions are such that it can be cheaply secured. Hollow tile is in somewhat the same class though requiring further development before its possibilities can be fairly judged. Concrete, especially " poured " concrete, is of value chiefly in large-scale housing undertakings, though of course the steel forms once bought can be used to pour one house or a hundred. The progress of stucco depends especially on the certitude of good workmanship in its use.

The plan of the cottage centers around the kitchen, and indeed the necessary size of the kitchen may be said to mark — inversely — the social progress of the worker's family. This evolution, however, takes different forms in various sections of the country, so that the following outline of it can claim to be only a general suggestion. When the family income averages about $10 or less per week, the wife usually has all her time consumed in cooking, washing, caring for the children, and doing outside washing or going out herself to work; in such homes the kitchen is perforce the family living-room, and should be made proportionately ample. In one case where that has been done — certain of the brick houses of the Salem Rebuilding Trust — the rent is $15 a month, thus making it doubtful whether those houses can be used by the families likely to live in the kitchen. Roughly speaking, when the weekly income approaches $18, while the family may eat in the kitchen, they want a " best room " in which to receive callers, actual or hoped-for. In families of a higher income class, the housewife is quite willing to carry food and dishes into the dining-room in order to escape eating the food in the place where it was cooked; also a separate dining-room is deemed more comfortable by the rest of the family. If there are only two rooms besides the bedrooms, families with low incomes are more likely to combine the dining-room with the kitchen, leaving the other room for a parlor; as the income rises the living-room assumes increased importance, absorbing the dining-room when necessary. (A higher differentiation from the kitchen occurs when much of the food is prepared in the pantry and the dishes washed in the passageway between dining-room and kitchen.) Much might be written on the psychology of the parlor. Often, particularly in the country, the " best room " has become so lifeless as compared with the kitchen or with a separate living-room that it is little more than a mausoleum of family culture. One may not enjoy being there, but the possession of such a room nevertheless tends to elevate the family life.

However inexact these suggestions are, they may be justified as calling attention to the need of carefully considering the relation between the arrangement and equipment of the house on the one hand and on the other the family habits and standard of living of the people that the location and rent are likely to attract. All too frequently the failure to " connect " in this respect frustrates the attempts of philanthropic agencies to provide good housing for the people who most need it.

And, to judge from Chart D, many of the present-day enterprises in low-cost cottage housing are likely to reach a slightly higher class than that which they are aiming to help. The cottage of the future is still unplanned, but the need of the future as of the present is clear, — that the working-classes of low income should be housed according to the highest standards of health, convenience, and comfort. To this task architects and builders, employers and industrial counsellors may well devote their best thought. And the workers themselves must be enabled and incited to give more intelligent attention to the physical surroundings in which they live, to the dwellings in which they struggle to bring up the nation's future citizens.

CHART A. LOW-COST FRAME HOUSES (DETACHED)

No	Name of Company	Location of Houses	Approximate Date of Construction	Approximate Cost of Construction	Rent per Month	No. of Rooms (except toilet)	Type of Roof	No	Foundation and Cellar (= C)	Plumbing	Lighting	Heating
1	American Rolling Mill Co.	Middletown, Ohio	1915	$1200	$14	4	Hip and pitch	1	Concrete C	(Hydrant and privy outside)		
2	Atlas Coal Co.	Atlasburg, Pa.	Since 1913	925–1266	2 per room	4–6	Hip	2	Concrete C	(Hydrant and privy outside)		Fire-grate in each room
3	Colorado Fuel and Iron Co.	Lime, Primero, and other camps in Colorado	Before 1904 1916	650–900 936.50	2 per room	4 (and 3)	Hip	3		Sink, sometimes	Electricity	Stoves
4	Duluth, Missabe and Northern Railway Co.	Proctor, Minn.	....	895	10	4	Hip	4	Posts (inclosed)	Water, $60 extra	Electric wiring, $70 extra	
5	Ellsworth Collieries Co.	Ellsworth and Cokeburg, Pa.	Since 1900	Under 1000	....	4	Pitch	5	Concrete block C	Sink; no bath	Electricity and gas	Stoves
6	New Jersey Zinc Co. of Pa.	Palmerton, Pa.	1912–16	1000	....	4	Hip and pitch	6	Concrete C	Toilet; sink in kitchen	Electricity	
7	Oliver Iron Mining Co.	Minnesota	....	....	1.50 per room	3–5	Hip and pitch	7		Sink in kitchen	Electricity	
8	Tennessee Coal, Iron, and Railroad Co.	Tennessee	....	....	5–8	4 and 5	Hip	8	Brick pillars	Sink in kitchen		Fire-grate in each room
9	J. B. and J. M. Cornell Co. (dissolved)	Coldspring, N. Y.	1899	1800	12–15	7	Pitch	9	Stone; C-earth floor	3-fixture bathroom; sink		Hot-air furnace
10	Framingham Associates	Framingham, Mass.	1912	1700	15	5	Pitch and gambrel	10	Concrete C	3-fixture bathroom; sink		Furnace
11	Ludlow Manufacturing Associates	Ludlow, Mass.	1907 1914	1800 2200	....	6	Pitch	11	Brick; C-cement floor	3-fixture bathroom; sink	In most, electricity or gas	In most, hot-air furnace
12	Peckham, Wolfe and Co.	Schenectady, N. Y.	1909–10	1800	....	6	Hip and pitch	12	Concrete block C	3-fixture bathroom; sink	Electricity and gas	
13	Postum Cereal Co.	Battle Creek, Mich.	1896–1900	1016–1800	12.91–19.75	5–7	Pitch and gambrel	13	Stone			
14	Rockton Realty Co.	Amsterdam, N. Y.	1909 1915	1790 1830	....	6	Pitch and gambrel Pitch	14	Stone C	3-fixture bathroom; sink and boiler	Electricity and gas	No furnace
15	Waterbury Tool Co.	Waterbury, Conn.	1916	2100	18	5	Gambrel	15	Stone C	3-fixture bathroom; sink	Electricity	Hot-air furnace
16	Beloit Model Homes Co.	Beloit, Wis.	1916–17	1550	....	5		16	Concrete; C-cement fl.	3-fixture bathroom; sink; set tubs in C	Electricity and gas	Hot-air furnace; gas heater
17	Billerica Garden Suburbs, Inc.	North Billerica, Mass.	1916	1800	....	6	Pitch	17	Concrete C	3-fixture bathroom; sink	Electricity	Furnace
18	Civic Building Co.	Flint, Mich.	1917	1500–2200	....	5–8	Hip and pitch	18		3-fixture bathroom; sink; hot-w. boiler		Hot-water furnace
19	Danielson Construction Co.	Danielson, Conn.	1916–17	1900	17	8	Pitch and gambrel	19		2 3-fixture bathrooms; sink	Electricity	
20	Goodyear Cotton Mills, Inc.[1]	Killingly, Conn.	1916	2000	....	6	Pitch and gambrel	20	Concrete C	3-fixture bathroom; sink		Stoves
21	Kenosha Homes Co.	Kenosha, Wis.	1916	1700–1900	....	5–7	Pitch	21	Concrete block	2 and 3-fixture bathroom; sink		
22	Mt. Union Refractories Co.	Kistler, Pa.	1915	1000–1600	10	6	Pitch and gambrel	22	Field-stone	2-fixture bathroom; sink and set tubs	Electricity	Furnace
23	(Name withheld)	Pittsfield, Mass.	1915	1700	....	4 (finished; 3 unfinished)	Pitch	23	Concrete; C-cinder fl.	3-fixture bathroom; sink	Electricity	
24	Tennessee Land Co.	Fairfield, Alabama	1913	2600	19.50–27.50	4 and 5	Hip	24	Brick	3-fixture bathroom; sink	Electricity	Grates or furnace

NOTE I. — Clapboards are the exterior wall-covering most frequently used. However, Nos. 6, 10, 20, 22, 23, and to a large extent 21, use shingles; 9, 11, 14, and 15 have the first story clapboarded and the second shingled, and 18 and 19 have both shingled and clapboarded houses. The roofs are predominantly of shingles; but Nos. 2 and 6 use slate, 17 uses asphalt shingles, and 22 rubberoid roofing.

NOTE II. — The data concerning plumbing and heating is incomplete as some of the fixtures installed have been overlooked in the reports submitted by the companies.

[1] The Killingly houses were constructed by the Aberthaw Construction Co., Boston, Mass.

CHART B. LOW-COST FRAME HOUSES (SEMI-DETACHED)

No.	Name of Company	Location of Houses	Approximate Date of Construction	Approximate Cost of Construction	Rent per Month	No. of Rooms (except toilet)	Type of Roof	No.	Foundation and Cellar (= C)	Plumbing	Lighting	Heating
1	American Rolling Mill Co.	Middletown, Ohio	1914	1922[1]	$12.50	5	Hip and pitch	1	Concrete	(Hydrant and privy outside)	Electricity	Kitchen stove; coal
2	Barre Wool Combing Co., Ltd.	South Barre, Mass.	1908–09 1913	1040 1950	....	6 7	Gambrel Pitch	2	Concrete	3-fixture bathroom; sink		Stoves
3	Danielson Construction Co.	Danielson, Conn.	1916–17	1800	....	....	Gambrel	3		3-fixture bathroom; sink	Electricity	
4	Ellsworth Collieries Co.	Ellsworth, Pa.	Since 1900	1000–1500	....	6	Pitch	4	Concrete block	Sink; no bath		Stoves
5	Goodyear Cotton Mills, Inc.	Killingly, Conn.	1916	1800	....	5 and 6	Hip and pitch	5	Concrete C	2-fixture bathroom; sink		Stoves
6	H. C. Frick Coke Co.	Westmoreland County, Pa.	....	....	....	6	Pitch	6	Stone			
7	Ludlow Manufacturing Associates	Ludlow, Mass.	1913	1350 1600	....	4 6	Hip	7	Brick	Toilet and kitchen sink 3-fixture bathroom; sink	Chiefly electricity	In most, hot-air furnace
8	Midland Improvement Co.	Midland, Pa.	....	....	12	5	Pitch	8	Brick	Toilet; sink	Electricity and gas	Fireplaces
9	Mt. Union Refractories Co.	Kistler, Pa.	1916	1200[1]	10	5	Hip	9		Toilet, showers and sink		Stoves
10	Plymouth Cordage Co.	North Plymouth, Mass.	1903	1200–2000	6.50–11	5–7	Pitch and gambrel	10	Stone; C-cement floor	2-fixture bathroom; sink	(Kerosene)	Stoves
11	Waterbury Tool Co.	Waterbury, Conn.	1916	....	About 24	6 and 7	Hip	11	Concrete C	3-fixture bathroom; sink	Electricity	Hot-air furnace
12	Witherbee, Sherman and Co.	Mineville, N. Y.	1915–16	750 1187.50	7 About 10	....	Pitch	12	Stone C		Electric wiring extra	Stove or furnace

NOTE I. — The data concerning plumbing and heating is incomplete as some of the fixtures installed have been overlooked in the reports submitted by the companies.

[1] Construction cost figures for Nos. 1 and 9 include cost of land.

CHART C. COMPARATIVE CONSTRUCTION COSTS

Showing Excess Cost of Various Materials over Frame (Clapboard) Construction

SOURCE AND NATURE OF DATA		Frame: Clapboarded	Frame: Shingled	8-inch Common Brick	8-inch Face Brick Exterior	8-inch Harvard Brick Exterior	10-inch Hollow Brick Wall	12-inch Common Brick	12-inch Face Brick Exterior	Brick Veneer on Frame (Boarding)	Brick Veneer on Frame (Studding)	Brick Veneer on Hollow Tile	"Fisklock"–"Tapestry" Brick	Stucco on Metal Lath or Wire Cloth	Stucco on "Bishopric Board"	Stucco on Brick, 9-inch Wall	Stucco on Hollow Tile	Tex-faced Hollow Tile (Plastered Int.)	Cement Block	(Van Guilder) Poured Concrete Hollow Walls
		Base	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Estimates for 8-room house made by 5 contractors in or near Boston. (From "The Cost of a House" by J. P. B. Fiske, in the *Brickbuilder*, March, 1911.)	Average of Five Bids...	$6760	1.6				9.1	13.0		6.9	5.8	10.7		2.9			6.3			
	Average of Two Lowest Bids.......	7071	.7				6.5	10.7		4.4	3.3	7.7		2.5			4.9			
Estimates (by a Boston contractor) of comparative net costs to the contractor for single house. (From "'Fisklock'–'Tapestry' Brick," adver. pamph. of Fiske and Co., 1915.)	For Boston..	7000	.3	4.0	8.1	7.7	10.5	8.8	13.1	5.9			4.4	4.0			5.7			
	For New York..		.5	2.4	6.7	7.9	8.8	6.5	11.0	5.3			3.3	3.3			4.3			
From "What Types of Houses to Build," by P. R. MacNeille, pp. 76, 77, *Proceedings of Fifth National Housing Conference*, 1916. (Figures computed)....................										1.8		2.7					1.4	−1.1		
From advert. article on stucco by W. H. Boughton, *Architectural Review*, April 1917. (Figures computed)			.8											1.4	−2.7	9.7				
From "Fireproof Construction to Compete With Wood," advertising pamphlet of Van Guilder Hollow Wall Co., 1914. (Figures computed)				3.7				10.6											5.0	−3.1
Average Percentage Excess over Frame (Clapboard) Construction			.8	3.4	7.4	7.8	8.7	9.9	12.0	4.9	4.5	7.0	3.8	3.0	−2.7	9.7	4.5	−1.1	5.0	−3.1
		c.	c.	c.	c.	c.	c.	c.	c.	c.	c.	c.	c.	c.	c.	c.	c.	c.	c.	c.
Estimates (by a Boston contractor) of comparative costs (net to contractor) per sq. ft. of exterior wall surface. (From "'Fisklock'–'Tapestry' Brick," adv. pamphlet of Fiske and Co., 1915.)	For Boston..	27.3	28.2	38.3	49.4	48.3	56.0	51.3	63.0	43.3			39.4	38.2			42.9			
	For New York..	30.0	31.6	37.3	50.0	53.8	56.4	49.7	63.0	45.8			39.9	39.8			42.8			
Cost per cubic foot. (From advertising pamphlet of General Fireproofing Co.)	Wood Interior .			19						17				16			17			
	Cement and Steel Interior.							28									26			

CHART D. SUMMARY AND INDEX

Showing the Chief Low-Cost Cottage Housing Enterprises for American Wage-Earners

Approximate Selling Price without Land	Approximate Date of Construction	Name of Company	Location of Houses	No. of Rooms	Type of Construction	Reference
Less than $1000	Since 1912	Atlas Coal Co.	Atlasburg, Pa.	4	Detached; frame	Page 6; Chart A
	Before 1904 also 1916	Colorado Fuel and Iron Co.	Various camps in Colorado	4 (and 3)	Detached; frame	
	....	Duluth, Missabe and Northern R.R. Co.	Proctor, Minnesota	4	Detached; frame	
	....	Oliver Iron Mining Co.	Minnesota	3, 4 and 5	Detached; frame	
	1915–16–17	Phelps-Dodge Corporation	Tyrone, New Mexico	4 and 5	Det. and semi-det.; stucco on tile	Page 16
	....	Sexton Manufacturing Co.	Fairfield, Ill.	4	Poured concrete	Page 22
	Since 1904	Witherbee, Sherman and Co.	Mineville, N. Y.	6	Det. and semi-det.; conc. block	Page 16
$1000 and less than $1500	1915	American Rolling Mill Co.	Middletown, O.	4	Detached; frame	Chart A
	1912	Delaware, Lackawanna and Western Railroad Co.	Nanticoke, Pa.	6	Semi-det.; poured concrete	Page 20
	Since 1900	Ellsworth Collieries Co.	Ellsworth and Cokeburg, Pa.	4	Det. and semi-det.; frame	Chs. A & B
	....	H. C. Frick Coke Co.	Westmoreland County, Pa.	6	Semi-detached; frame	Chart B
	1913–14	Lehigh Valley Coal and Navigation Co.	Hauto, Pa.	4	Detached; hollow tile	Page 15
	1915	Mt. Union Refractories Co.	Kistler, Pa.	5	Semi-detached; frame	Page 7
	1912–16	New Jersey Zinc Co. of Pa.	Palmerton, Pa.	4	Detached; frame	Chart A
	1896–1900	Postum Cereal Co.	Battle Creek, Mich.	5–7	Detached; frame	Chart A
	Since 1904 1915–16	Witherbee, Sherman and Co.	Mineville, N. Y.	6	Det. and semi-det.; conc. block Semi-detached; frame	Page 16 Chart B
$1500 and less than $2000	1912	Albany Home Building Co.	Albany, N. Y.	4	Det.; concrete slabs	Page 23
	1914	American Rolling Mill Co.	Middletown, O.	5	Semi-detached; frame	Page 12
	1916	Billerica Garden Suburb, Inc.	North Billerica, Mass.	6	Detached; frame	Page 7
	1913–14	E. H. Clapp Rubber Co.	Hanover, Mass.	....	Detached; stucco on frame	Page 24
	1899	J. B. and J. M. Cornell Co.	Coldspring, N. Y.	7	Detached; frame	Chart A

$1500 and less than $2000	1917	Densmore and Kerr	Lockport, Pa.			
	....	Also Ebensburg Coal Co.	Ebensburg, Pa.	6	Detached; brick	Page 14
	....	Munroe Coal Co.	Ebensburg, Pa.	5	Semi-detached; brick	
	....	Pennsylvania Coal and Coke Co.	Sides, Pa.			
	....	(Edison system)	Midland, Pa.	4	Detached; poured concrete	Page 19
	1912	Framingham Associates	Framingham, Mass.	5	Detached; frame	Chart A
	1916	Kenosha Homes Co.	Kenosha, Wis.	5–7	Detached; frame	Page 8
	1913	Ludlow Manufacturing Associates, Inc.	Ludlow, Mass.	4–6	Detached and semi-det.; frame	Chart A
	....	Midland Improvement Co.	Midland, Pa.	5	Semi-detached; frame	Chart B
	....	(Morrill system)	Brentwood, Md.	4	Detached; poured concrete	Page 20
	1915	Mt. Union Refractories Co.	Kistler, Pa.	6	Detached and semi-det.; frame	Page 7
	1909	Peckham, Wolfe and Co.	Schenectady, N. Y.	6	Detached; frame	Chart A
	1903	Plymouth Cordage Co.	North Plymouth, Mass.	5–7	Semi-detached; frame	Page 12
	1917–18	Port Wentworth Terminal Corp.	Port Wentworth, Ga.	5	Detached; frame	....
	1909 & 1915	Rockton Realty Co.	Amsterdam, N. Y.	5 and 6	Detached; frame	Chart A
	....	John A. Roebling's Sons Co.	Roebling, N. J.	6 and 7	Detached; brick and stucco	Page 15
	....	Sage Foundation Homes Co.	Long Island, N. Y.	6	Det.; pre-cast concrete units	Page 17
	1913	Salem Rebuilding Trust, Inc.	Salem, Mass.	4 and 5	Semi-detached; brick	Page 13
	1915	(Name withheld)	Pittsfield, Mass.	4–6	Detached; frame	Page 9
$2000 and less than $2500	1913	Barre Wool Combing Co.	South Barre, Mass.	7	Semi-detached; frame	Page 12
	1916–17	Beloit Model Homes Co.	Beloit, Wis.	4 and 5	Detached; frame	Page 8
	....	Chamber of Commerce	Elmira, N. Y.	....	Detached; stucco on frame	Page 24
	1917	Civic Building Co.	Flint, Mich.	5–8	Detached; frame	Page 10
	1916–17	Danielson Construction Co.	Danielson, Conn.	8	Detached and semi-det.; frame	Page 10
	1916	Goodyear Cotton Mills, Inc.	Killingly, Conn.	6	Detached and semi-det.; frame	....
	1913	Goodyear Tire and Rubber Co.	Akron, O.	6	Detached; stucco	Page 23
	1913–14	Lehigh Valley Coal and Navigation Co.	Hauto, Pa.	5 and 6	Detached; hollow tile	Page 15
	1916	Ludlow Manufacturing Associates, Inc.	Ludlow, Mass.	6	Detached; frame	Chart A
	1910	Modern Homes Co.	Youngstown, O.	4–5	Det.; concrete hollow block	....
	....	(Morrill system)	Virginia Highlands, Va.	6	Detached; poured concrete	Page 20
	1916	Waterbury Tool Co.	Waterbury, Conn.	5	Detached; frame	Chart A

Note. — This chart indicates only the companies whose activity in this particular division of housing is represented in the collections of the Harvard Social Museum. The Social Museum contains exhibits covering the whole field of housing, rural and urban, in this country and abroad.

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1. The Social Museum as an Instrument of University Teaching. By F. G. Peabody. A Classified List of the Collections in the Social Museum of Harvard University to January, 1908. Pp. 34.

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3. A Guide to Reading in Social Ethics and Allied Subjects. By Teachers in Harvard University. Pp. 265. (Price, bound, $1.25; postpaid, $1.38. Harvard University Press, Randall Hall, Cambridge, Mass.)

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5. The Housing Problem. By James Ford. A Summary of Conditions and Remedies, prepared to accompany the Housing Exhibit in May, 1911, of the Harvard Social Museum. Pp. 39.

6. Bulletin No. 2 of the Social Research Council of Boston. An Additional List of Social Investigations in Greater Boston, December, 1913. Pp. 38.

7. Low-cost Cottage Construction in America. By Winthrop A. Hamlin. A Study Based on the Housing Collection in the Harvard Social Museum. Pp. 60.

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Bulletin No. 1. A Preliminary List of Recent Social Investigations in Greater Boston. Cambridge, July, 1912. Pp. 42.